AVIATION WEEK

JUNE 13, 1955

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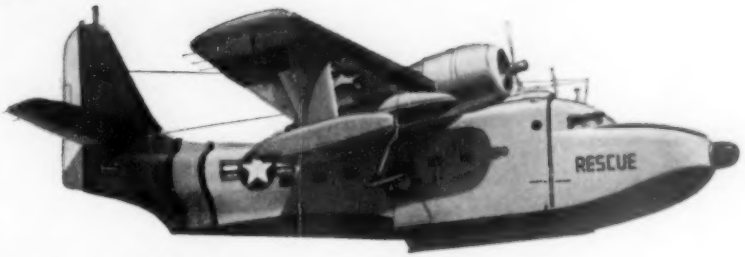

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In answer to the airman's emergency distress signal, "Mayday, Mayday", the Albatross has grown from a speck to a queen to many a man marooned in a dinghy or on an icecap. Flown by skilled crews of the U. S. Air Force, Air Rescue Service, the U. S. Navy and Coast Guard, the Grumman Albatross can land and take off from snow and ice, as well as land and sea. Though she doesn't fit into the airman's survival kit, she's part of it.

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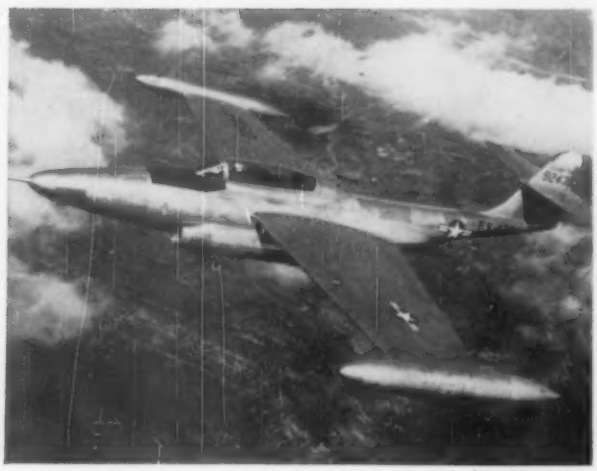
Grumman F9F-9 Tiger

Martin B-57B



Northrop Scorpion

Inflatable rubber band gives fighters more stretch

SEVERAL YEARS AGO, canopy seal blowout trouble sometimes hampered fighters at high altitudes. The effect of high pressure inside the canopy and low pressure outside could "pop" the inflatable seal between the canopy and fuselage. It had to stretch so much to make an air-tight seal, it couldn't stand the strain. When that happened, the pilot had to get down fast.

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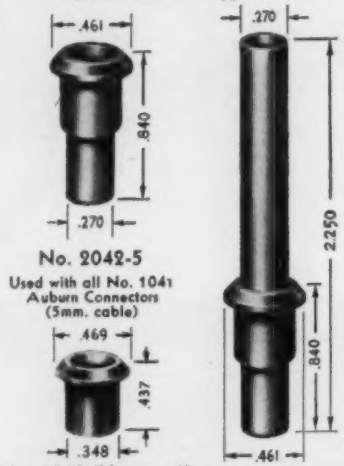

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No. 1042 (Hypreen*)
No. 1043 (Silicone)
Used with all No. 1041 Auburn Connectors (7mm. cable)

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*Auburn Synthetic Rubber

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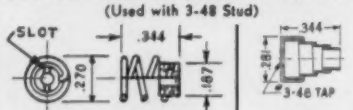
(Used with 3-48 Stud)



No. 1066-9A (AN 4164-22) with stainless steel coil springs

No. 1066-9V with Inconel volute springs

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with Inconel volute springs

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1041-M Mycalex
1041-D Alumina
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1041

1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina
(AN 4164-1)

1099

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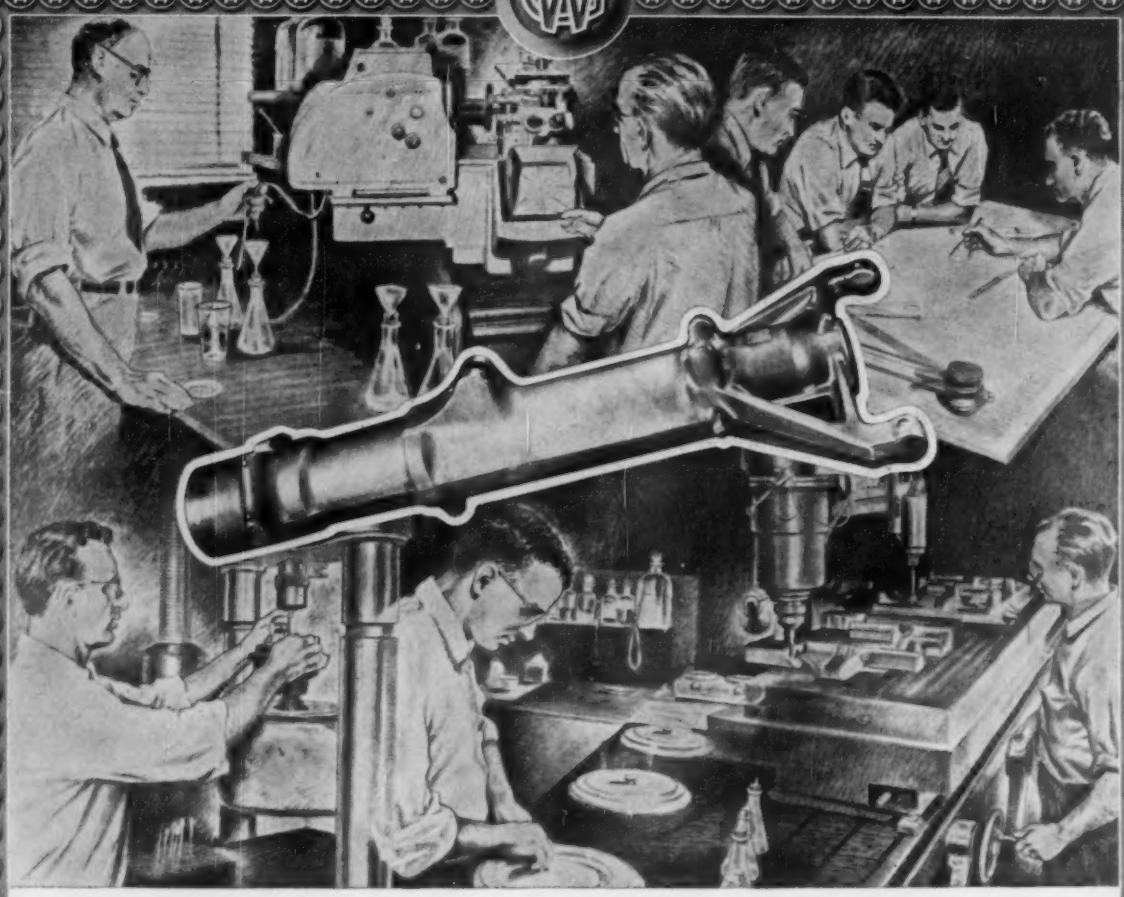

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NEWS DIGEST

Domestic

Atomic Energy Commission has asked Congress to provide $37.9 million for "sharp intensification and expansion" of its aircraft nuclear propulsion program in Fiscal 1956. Sharp increase from the estimated $21.5 million spent on the project in Fiscal 1955 is warranted, AEC told a House Appropriations Subcommittee, by encouraging developments in the past year, including a new approach to the problem. Money will be used to emphasize research and development, carry out experiments and start operation of facilities at the national reactor testing station.

Institute of the Aeronautical Sciences selected Maj. Gen. Albert Boyd, commander of Wright Air Development Center, for this year's Octave Chanute Award and Dr. Gottfried Guderley, WADC civilian scientist, for the 1955 Thurman H. Bane Award. Honors will be presented June 23 in Los Angeles at the Fifth International Aeronautical Conference, sponsored by IAS and Britain's Royal Aeronautical Society.

Hydro-Aire, Inc., and U. S. Air Force announced last week that the company's Hytrol braking system, an anti-skid device, will be standard equipment on latest military jets. Most recent order was received from Republic Aviation Corp., which will install the system on its RF-84F. Military Air Transport Service also confirmed it would use Hytrol wherever applicable in its transport fleet. Hytrol is standard equipment on the A3D, B-66, F-100, B-47 and B-52.

United Air Lines ordered two more DC-6B simulators and one for the Convair 340 from Curtiss-Wright Corp.'s Electronics Division at Carlstadt, N. J. They will give UAL four DC-6B and three 340 crew training units.

Solar Aircraft Co. received a $2.3-million contract from Curtiss-Wright Corp.'s Wright Aeronautical Division to produce afterburners and other components for "late model" turbojet engines. The San Diego firm is completing negotiations for a contract to develop and build afterburners for a British aircraft company.

A. Daniel Frankforter, 40, chief of the photographic laboratory at Fairchild Engine & Airplane Corp.'s Aircraft Division, died May 29 at Waynesboro, Pa.

Eisenhower Gets Light Twin for Commuting

President Eisenhower's use of an Aero Commander 560 light twin-engine aircraft for commuting from Washington to his Gettysburg, Pa., farm will spur wider acceptance of flying by many businessmen who have been reluctant to go aloft, lightplane industry spokesmen say. Eisenhower's pilot Lt. Col. William G. Draper (right), says the President feels it is safer to fly the approximately 80 mi. than to go by car.

Financial

Lockheed Aircraft Corp. reported a net profit of $4,596,000 for the first quarter of 1955, declining from $4,808,000 for the same period last year. Sales totaled $190,452,825, dropping 12% from $215,574,304. Backlog Apr. 3: $1,085,401,000.

North American Aviation, Inc., declared a regular quarterly dividend of 75 cents on capital stock, payable July 6 to shareholders of record June 16.

Northrop Aircraft, Inc., will pay a 40-cent quarterly dividend June 20 to capital stockholders of record June 6.

Temco Aircraft Corp. declared a regular quarterly dividend of 15 cents on common shares, payable July 8 to stockholders of record June 16.

International

Canadian Pacific Airlines wants four Comet 4s, if de Havilland Aircraft Co. can deliver the $2.8-million jet transports by mid-1959, CPA President G. W. McConachie announced in London last week. He arrived on the airline's inaugural transpolar flight between Vancouver and Amsterdam. Canadian Pacific wants Comet 4s to replace Douglas DC-6Bs on over-the-pole service (AW May 9, p. 113).

Sncase Alouette 2 set a helicopter record altitude of 27,258 feet June 6. The French copter, powered by a Turbomeca Palouste jet engine, bettered the 24,500 foot mark made Oct. 17, 1954, by a Sikorsky XH-39.

Varig Brazilian Airlines completed a survey flight of its Rio de Janeiro-New York route. The carrier will begin scheduled service on the 5,070-mile route July 29 with 62-passenger Lockheed Super Constellations.

Avianca Colombian National Airlines contracted with Pan American World Airways for reconversion of 20 DC-3s to Hi-Per configuration. Total cost: more than $3 million.

Royal Canadian Air Force has reached its authorized strength of 41 squadrons, the Defense Department reported. Nine fighter squadrons are equipped with all-weather Avro CF-100 jet interceptors.

Bell Aircraft Corp. licensed Hubschrauber-Bertrievs Gesellschaft of Hamburg to sell commercial helicopters and spare parts in West Germany.

ANGLgear reduces cost

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The Aviation Week

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WHO'S WHERE

In the Front Office

Sir Robert A. Watson-Watt, president and board chairman of Logistics Research, Inc., Redondo Beach, Calif.

Dr. Thomas J. Killian, deputy chief and chief scientist of the Office of Naval Research. He succeeds **Dr. Emanuel R. Piore**, who resigned to join Avco Manufacturing Corp. as vice president and chairman of the advanced scientific research committee.

Adm. H. B. Sallada (USN Ret.), executive vice president of Chance Vought Aircraft, Inc., Dallas. New vice presidents: **N. V. Turney**, controller; **R. C. Blaylock**, engineering; **C. E. Burt**, production, and **W. P. Thayer**, sales and service.

John R. Alison, vice president-customer relations of Northrop Aircraft, Inc., Hawthorne, Calif. Also promoted: **Robert R. Miller**, administrative vice president, and **Gil Nettleton**, assistant to the president.

Gerald B. Brophy, vice president-general counsel of North American Aviation, Inc., Los Angeles. He will continue as a senior member of the New York law firm of Chadbourne, Parke, Whiteside, Wolff & Brophy.

Robert L. Earle, director and executive committee member of Marquardt Aircraft Co., in addition to his regular duties as executive vice president of the Van Nuys, Calif., firm.

E. C. Mireau, vice president-manufacturing of Zenith Aircraft, Gardena, Calif., division of Zenith Plastics Co.

Joseph B. Rice, vice president-manufacturing, and **George B. Holmes**, assistant treasurer, ElectroData Corp., Pasadena, Calif.

S. Merrill Skeist resigned as vice president-contracts of W. L. Maxson Corp., New York. He will continue as a consultant.

Lionel Machado, vice president-operations, and **George K. Tanabe**, assistant secretary and assistant treasurer, Hawaiian Airlines, Ltd.

Honors and Elections

Brig. C. Stephen Booth, Assistant Deputy Minister of Canada's Department of Transport, elected president of the Ninth Session of the International Civil Aviation Organization. Vice presidents: **H. E. Montague Jayawickrama**, Ceylon; **Raffaele Ferretti**, Italy; **Rear Adm. Charoon Vichayapai Bunnag**, Thailand; **Julio Hoepelman**, Dominican Republic.

G. T. Baker, president of National Airlines, installed as the first honorary member of the Gamma Chapter of Sigma Alpha Tau, national honorary aviation fraternity.

Dr. Jerome C. Hunsaker, chairman of the National Advisory Committee for Aeronautics, will receive an honorary doctor of science degree June 15 from Adelphi College at Garden City, N. Y.

Changes

Carl J. Eaton, director of engineering, and **L. R. Lentz**, assistant director, in Champion Spark Plug Co.'s reorganized engineering and research activities at Toledo.

(Continued on page 70)

INDUSTRY OBSERVER

(Editor's Note: This column was written by Aviation Week editors who attended the Aviation Writers Association Convention and the Canadian International Trade Fair in Toronto)

► A Czechoslovakian pilot in a two-seat Motokov trainer single-handedly stole Canada's air show last week from U. S. and Canadian military pilots flying powerful jet aircraft.

In an astounding flying display, the Czech pilot performed seemingly impossible low-altitude aerobatics that drew round after round of applause from veteran aviation observers. Performance of the aircraft from behind the Iron Curtain was as startling as that of the pilot. It far overshadowed excellent aerobatic performances by the de Havilland Chipmunk primary trainer and Avro CF-100 jet interceptor.

What many of those attending the show did not realize was that the pilot himself had reassembled the trainer in a hangar the night before after its shipment from Czechoslovakia was delayed.

The Czech pilot flew the trainer past the reviewing stand upside down only a few hundred feet off the water of Lake Ontario and then pushed up into what can only be described as the last half of an outside loop to head in the opposite direction rightside up—an immelman without a roll. In another maneuver, he made a 360 deg. turn low over the water while inverted and then climbed away to an altitude of perhaps 1,500 ft.—still upside down.

The trainer, powered by a 105 hp. Walter Minor engine, weighs less than 2,000 lb. although it was listed in the official program as a military trainer, the Czechs asked that an announcement be made that it was a civilian trainer.

► Static display of Czechoslovakian aircraft at the Canadian International Trade Fair included a two-seat LF109 Pionyr sailplane and a five-place Motokov Aero 45 executive aircraft. Powered by two 105-hp. Walter Minor 4-111 engines, the Aero 45 is credited with a maximum speed of 178 mph., cruising speed of 152 mph. The Czechs hope to find Canadian and U. S. markets for this aircraft, priced at about $36,000.

► Field Aviation Company, Ltd. of Canada has designed a tanker configuration of the Blackburn Beverley C. Mk. I military medium range freighter. The Beverley is in production at Blackburn's plant in England for the RAF Transport Command. The tanker version would be capable of delivering up to 6,000-gal. of fuel per flight to Arctic outposts. Takeoff power of the 2,850 bhp. Bristol Centaurus engines would be boosted to 3,150 bhp. by direct fuel injection.

► Royal Canadian Air Force has not decided whether to go ahead with the expensive job of modifying its two de Havilland Comet 1As. Modification would be done at de Havilland Canada with two kits sent over from Britain. Plans call for wing changes and strengthening around the windows. The aircraft still would be subject to altitude and pressurization limits.

► CF-100s of the RCAF will be equipped with an automatic ice detection and shedding control system developed by Applied Research Ltd. of Toronto. The all-weather interceptors also will carry the R-theta navigation computer system which won this year's McKee Trophy for its inventor, Wing Commander Jerauld G. Wright.

► Production of de Havilland Canada's CS2F Grumman anti-submarine aircraft for the Royal Canadian Navy is expected to start in the spring of 1956. Tooling is underway. Canada's new aircraft carrier, the Bonaventure, under construction at Belfast, Ireland, is to be ready late next year.

► Development of Avro Canada's delta-wing supersonic CF-105 is being pushed at full speed. Most of the $50-million which RCAF will spend this year on research is budgeted for this aircraft.

► Avro Canada's Jetliner is in use as a test and development aircraft. Company President Crawford Gordon says the Jetliner no longer has any commercial potential—"because of time lag, it is now obsolete."

By Unanimous Agreement

These men, representing the armed services, discuss, debate—and finally agree upon a course of action. By so doing, they demonstrate a fact that is basic in the thinking of RCA: no matter what the equipment may be—atomic, electronic, chemical or structural—it takes *a man* to run it! There is no substitute for the human brain. The man always far outvalues the equipment he uses. Without him, it is meaningless.

With *him* in mind, RCA has gathered one of the world's greatest scientific teams and put it to the task of providing electronic equipment that includes the latest and most advanced thinking, engineering and designing.

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RCA ENGINEERS HAVE FREEDOM TO CREATE!

They rank among the world's best and are leading the way toward new electronic products for our national defense as well as for better living for all. What they have produced thus far—wonderful as it is—is but a token of what they will accomplish in the months and years ahead. Because of its freedom to create, RCA is attracting to its staff engineers with the training, skill and courage to explore the fascinating regions of the unknown, and to create new and better things for the benefit of mankind.

GOVERNMENT DEPARTMENT
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DIVISION CAMDEN, N.J.

Washington Roundup

New Aircraft Investigation?

Senate Finance Committee, headed by Sen. Harry Byrd (D.-Va.) may make a study of the reasons for the boom in aircraft manufacturing stock values since the defense build-up was started in mid-1950. Sen. Henry Dworshak (R.-Ida.) has turned over a report giving factual data on value increases to the committee. It was drawn up by the staff of the Senate Appropriations Committee, of which Dworshak is a member.

The appropriations compilation was touched off by a letter Dworshak received from a Connecticut businessman, Stanley Goldsmith, complaining he had made a paper profit in a few years of $20,000 on an investment in 100 shares of stock of Douglas Aircraft Co., "without lifting a finger." Goldsmith questioned: "Am I entitled to this profit? Should a corporation be allowed to make such huge profits at the expense of the government?"

Dworshak read the letter to the finance committee during testimony urging continuation of renegotiation law.

Three other congressional committees are looking into aircraft profits from different angles: House Appropriations, House Armed Services Investigating Subcommittee, Senate Banking and Currency (AW June 6, p. 11).

Talbott's Lead

Secretary of Air Force Harold Talbott led the Administration's case before Senate Finance Committee for extension of the Renegotiation Act, pointing out that this protection against excessive profits is particularly needed in the aircraft field, in which the major portion of contracts necessarily must be negotiated. Prompt enactment of legislation extending the law to Dec. 31, 1956 certain. All passed the House without debate.

Quick Airport Action

Expect quick Senate action on legislation providing for a $63 million-a-year federal-aid airport development program for the next four years (see p. 131).

Commerce Committee Chairman Warren Magnuson (D.-Wash.), says the full committee will act on it at its next meeting, either this week or next.

The aviation subcommittee headed by Sen. Mike Monroney (D.-Okla.) completed hearings in a week.

White House Dust

The trans-Atlantic Cargo Case in which the Civil Aeronautics Board is reported to have recommended certification of Seaboard and Western Airlines as a trans-Atlantic all-cargo carrier, continues to gather dust at the White House. Recent presidential action on other international cases—trans-Pacific, Balboa, States-Alaska—raised speculation that the CAB decision would also get attention from the President.

Meanwhile, the British cargo carrier Airwork Limited is authorized to perform all-cargo service across the Atlantic using Slick Airways DC-6A aircraft and crew.

Engineering Talent Waste?

Mounting criticism that U.S. aircraft industry makes inefficient use of engineering talent and that correction would overcome much of the alleged shortage is receiving attention at the Pentagon. Some civilian officials feel strongly that Defense Department ground rules must take a large share of the blame, citing cases where as many as 40 firms take part in a single design competition. Waste of engineering skill under this system is being studied.

Another conviction winning more converts is that military decision-making machinery is so ponderous it can't keep pace with technological progress. New ideas are coming along faster than they can be handled, which is one of the reasons for Hoover Commission's recent charge that the military lacks daring and imagination in approach to new weapons (AW June 6, p. 15).

Bilateral Concessions

Bilateral negotiations between the United States and West Germany in Washington last week pointed up widening concern in airline circles over concessions made by the State Department to foreign governments in bilateral agreements. Concern also exists over the small attention paid by U. S. carriers to the situation.

Entry of Lufthansa into trans-Atlantic service will mean severe competition to American carriers. In the last six months of 1954, 73,476 passengers traveled between the U. S. and Germany, 64,767 of them on U. S. carriers. Pan American World Airways now serves nine points in Germany and Trans World Airlines one. The German government wants to get Lufthansa into the lucrative U. S. air market to the greatest possible extent and has done some vigorous trading to accomplish this.

Much of the concern among U. S. airline people is over entry of foreign carriers into interior U. S. markets, such as existing and projected transpolar services which drain off traffic that used to travel across the United States on the way to Europe. Proposed services across the U. S. by British Overseas Airways Corp. and other foreign carriers also would penetrate the midwest and other interior markets.

Foreign governments like to trade routes on a point-for-point basis without regard to the air markets involved. U. S. carriers argue that the relative economic value of each point should be considered. The State Department is caught in the middle between these arguments and foreign policy considerations.

A U. S. delegation, headed by CAB member Josh Lee, is meeting with Japanese authorities in Tokyo in discussion designed to straighten out differences in interpretation of the bilateral agreement between the two countries. Discussions will also be held at the end of the month with the Netherlands government in an attempt to establish a bilateral agreement.

'Tremendous Trifle'

Top level Defense Department officials show no great concern over congressional investigations, either threatened or in progress. Last week, only hours after an Air Force captain made news headlines by admitting to a congressional committee false income tax returns while under suspicion for bribery in his procurement job, Defense Secretary Charles E. Wilson was asked by the press if he cared to comment on the current investigation.

"Is there one going on," he asked, "or is it we are just threatened with one?"

The press replied that it was going on and was concerned with sailor hats.

Replied the secretary: "That's in that tremendous trifle category, isn't it?"

—Washington staff

AVIATION WEEK

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JUNE 13, 1955

American Buys Lockheed Turboprop

By Robert Hotz

New York – American Airlines jumped into the jet transport era last week with a $65 million order for 35 Lockheed Electra turboprop airliners.

The joint statement by American Airlines President C. R. Smith and Lockheed Aircraft Corp. President Robert E. Gross, confirmed Aviation Week's prediction (May 16, p. 13) that American had shifted its turboprop transport specifications to a faster, longer range aircraft carrying a heavier payload and that a decision would be made soon between the Lockheed and Douglas entries in this competition.

Biggest surprise in the Smith-Gross statement was the fact that no decision has been made on the powerplants for the Electra. They said:

"Lockheed's design proposes the Allison T56 engine (now commercially certificated as the Allison Model 501) but no decision has yet been made concerning the powerplant as the Electra will be designed to use engines as high as 5,000 hp. with minimum modification."

Allison Engine, If . . .

Indications were that American Airlines would eventually buy the Allison T56, rated at 3,750 eshp., for the Electra, if Allison pushed development hard enough and organized a commercial service organization to back the engine in field service. However, it is believed that American will defer this decision until top level General Motors Corp. officials make it clear that they will back the Allison project with all of the resources and prestige of the giant corporation.

Meanwhile, American has been exploring the development of the Rolls-Royce RB 109 turboprop rated at 4,000 eshp. as a possible candidate for the Electra. Pratt & Whitney has a 5,700 eshp. T34 turboprop in production for military transports but it is unlikely that it would figure in the Electra deal because Lockheed and P&WA had a sharp disagreement on its possible use

(*Continued on page 14*)

Lockheed Electra Specifications

Cruising Speed	Over 400 miles per hour
Cruising Altitude	Up to 30,000 feet
Power Plants	Not decided (Aircraft design based on Allison Model 501)
Takeoff Power	Depending on powerplant, at least 3,750 eshp.
Wingspan	95 feet
Length	101 feet, four inches
Overall Height	34 feet
Gross Weight	98,500
Fuel Capacity	4,178 gallons
Cruising Range	2,000 miles
Seating Capacity	64, plus six in lounge
Cargo Space	400 cubic feet, exclusive of baggage space
Cargo Capacity	4,000 pounds.

Douglas Builds Prototype Turbojet DC-8

By William Coughlin

Santa Monica—Douglas Aircraft Co. has started work on its DC-8 jet transport prototype, with first flight scheduled for December, 1957.

Airline deliveries of the DC-8 will begin in 1959.

The Douglas jet transport will be powered by four 11,000 lb. thrust Pratt & Whitney J-57 engines mounted in pods on the sweptback wings.

The Douglas decision to build a DC-8 prototype followed a meeting of the board of directors of the company at the Santa Monica plant early last week. The Douglas action undoubtedly was prompted by a belief that the American Airlines order for Lockheed's turboprop transport together with the USAF order for Boeing jet tankers leaves Douglas with a clear shot at the commercial jet transport field.

Airline Interest

The company said that "international and transcontinental airlines throughout the world have shown great interest in this project but actual contract discussions and negotiations have been held in abeyance pending the decision to build a prototype."

A Douglas spokesman said the firm had no airline orders to announce "as yet."

The company said the new jet airliner will have a top speed in excess of 550 mph., which will enable it to make regular nonstop flights between the U.S. and Europe, regardless of headwinds.

Gross weight of the overwater version will be 257,000 lb. Domestic version will have a 211,000 lb. gross. Span of the DC-8s sweptwings will be 134.5 ft., length 140.5 ft. and height 40.2 ft.

This is somewhat larger than Boeing Airplane Co.'s 707 jet transport, prototype which is already flying but about the same size as the KC-135 tanker for which Boeing has a $700 million USAF production order.

Varying configurations call for from 80 to 125 passengers.

The J57 turbojet was recently cer-

Douglas DC-8 Specifications

Cruising Speed	Over 550 miles per hour
Cruising Altitude	Above 35,000 feet
Power Plants	Pratt & Whitney JT3L
Takeoff Power	11,000 lb. thrust
Wingspan	134 feet, six inches
Length	140 feet, six inches
Overall Height	40 feet, two inches
Gross Weight	211,000 lb. (domestic) to 257,000 lb. (overwater)
Fuel Capacity	18,000 gallons
Cruising Range	At least 3,700 miles
Seating Capacity	80 to 125.

Douglas DC-8

tificated for commercial use by the Civil Aeronautics Administration, but the Air Force has not yet removed military security restrictions that still prevent Pratt & Whitney from showing the engine to potential airline customers.

Commercial designation for the J57 is the JT3L. It will probably be rated at 11,000 lb. static thrust at sea level. The J57 has been in production in military versions since early 1953.

Route Times

Douglas lists the following route times for the DC-8: Los Angeles to New York, four and one-half hr., New York to Paris, six and one-half hr., Honolulu to San Francisco, a little over four hr.

The company said its huge new transport will be able to operate from existing major air terminals.

The Douglas decision comes at a time when the company is riding an unprecedented crest of commercial orders, with orders for more than 170 propeller-driven commercial transports since January. This year already is the company's greatest sales year in both numbers of aircraft and dollar volume.

Family Resemblance

The DC-8 will continue the "Douglas" look familiar throughout the DC series. Although jet-propelled, it will be easy to recognize the new airliner as a Douglas product.

Company President Donald W. Douglas does not expect the jet to cut into orders for piston transports but believes it will fall naturally into production behind the DC-7Cs due to the time it will take to develop the DC-8. The firm also believes orders for propeller-driven transports will continue long after the jet goes into production.

Eight airlines have Douglas DC-7Cs on order for deliveries beginning in 1956. They will be nearly 200 mph. slower than the DC-8. The backlog on these aircraft, totalling nearly $500-million, will keep the Santa Monica plant busy through the first quarter of 1958.

Spur to Boeing

The Douglas decision to go ahead with the DC-8 is expected to spur Boeing efforts to obtain a firm answer from the Defense Dept. on whether the Seattle firm will be permitted to turn out commercial jet transports before it completes its orders for the KC-135 jet tanker.

Boeing recently repeated its assertion that it will be able to deliver the first passenger jet transport in the U. S. in 1958. This would put Boeing a year ahead of Douglas on the jet transport, if the Air Force gives approval.

The Douglas DC-8 decision follows three years of technical studies and engineering development which cost the firm more than $3-million.

Reports from inside the Santa Monica plant say the latest DC-8 design differs from that shown to interested airlines some time ago, with greatly improved economic performance. The company says operating cost of the new jet will be lower than that for current airliners.

No announcement was made concerning reverse thrust devices for the Douglas jet but it is expected that production models will be equipped with reverse thrust.

Lockheed Electra

(*Continued from page* 12)
in the Model 1449 Super Constellation.

The Electra order, which calls for initial delivery in late 1958 with all 35 planes in service by mid-1959, will insure American Airlines a continued equipment lead in the domestic airline field.

Eastern Air Lines is expected to follow American soon with a substantial order for the Electra. American probably will make room on the Lockheed line for non-competing airlines who want to buy the Electra, but it will probably be at least six months after American takes delivery of its turboprop transports before competing airlines will be able to get the same aircraft into service.

The initial order for 35 Electras probably will be followed eventually by more orders to complete American's fleet replacement program on its medium haul Convair-Liners. Airline observers estimate that Lockheed has an opportunity for over 200 domestic airline sales on the Electra in addition to the foreign market where it will begin to cut into Vickers Viscount sales.

Joint Design Effort

The Electra will be the first commercial turboprop aircraft built in the United States. Its design was a joint effort by Lockheed's engineering staff headed by Vice-President Hall Hibbard and American Airlines' engineers sparked by Vice President William Littlewood. This transport will carry a playload of 70 passengers—64 regular seats plus six in the lounge—and 4,000 lb. of mail and cargo, over a 2,000 mile range at a cruising speed well above 400 mph. The Electra is expected to have a 100 mph. cruising speed advantage over the Vickers Viscount turboprop airliners about to go into U. S. service this summer with Capital Airlines.

The Electra will have a fuselage length of 101 ft. 4 in. and low-set straight thin wing with a span of 95 ft. Turboprop engines are mounted with tail pipes emerging on the upper wing surface so that no holes are necessary in the wing spars and the structural integrity of the wing can be maintained. Lockheed has abandoned its triple tail of the Constellation line for a single tail design.

Cabin Convenience

Built-in loading steps and cabin space for carry-on baggage—both features of American Airlines Convair-Liners—have been designed into the Electra. Interior cabin is several inches wider than any current transport now flying, according to American officials, making it possible to use wide seats equipped with individual tables for eating, writing or reading. Unusually large cabin windows measure 20 in. high and 16 in. wide.

The Electra will have a tricycle landing gear and an overall height of 34 ft. to the tip of the tail fin. Airborne radar will be standard equipment and the control system will be aerodynamically boosted. Flight crew will consist of two pilots and a flight engineer.

Although final decision on whose propellers will be used will have to await a firm engine order, reversible types have been specified to enable the Electra to operate on 5,000 ft. runways.

American will use the Electra as its standard medium haul transport with the 1,750 mile Chicago-Los Angeles segment, its longest nonstop route. It probably will go into service initially out of New York on nonstop operations to Chicago, and Ft. Worth and on the Boston-Washington run.

American probably will eventually buy a turbojet transport—most likely the Douglas DC-8—to replace the DC-7 for its transcontinental nonstop service. With the engine stretch built into the Electra, it will eventually edge close to the 500 mph. cruise class as more powerful turboprops become available.

Final Mail Pay Rate Set for Trunklines

Final mail rates for trunk airlines have been set by Civil Aeronautics Board in an order establishing a multi-element formula.

Trunkline service mail pay will be based on an 80-20 split between line haul charges and terminal handling charges. The line haul rate set for all carriers is 30.17 cents per ton-mile.

Terminal handling charges vary with the size of the airport. Class A stations, the largest, the charge is 3.32 cents per pound. Class B station rate is 6.64 cents per pound, Class C 9.96 cents and Class D 33.21 cents.

Russians Will Show Off More Aircraft

By William Coughlin

Toronto—Russia will unveil more of its new aircraft in a June 19 air show over Moscow, Soviet engineers told AVIATION WEEK in an exclusive interview here.

They said the new models "will make U. S. airpower look obsolete."

The Russians were members of a Soviet team which spent a week inspecting U. S., Canadian and British aircraft and engines on display at the Canadian International Trade Fair.

"The air demonstration over Moscow will display aeronautical models more advanced than those seen before," one of the Russians declared.

Asked whether this meant aircraft not seen in the Moscow fly-bys early last month, the Russian replied: "We try each time to show something new."

The Moscow demonstration will be in two sections, one for military aircraft and the other for sport and civilian planes, the Soviet engineers said. The demonstration, also, will include the customary mass jump of paratroopers.

The new aircraft will be seen only in fly-bys above Moscow and there will be no ground exhibits, the Russians said.

(The Soviet Air Attache at the Russian Embassy in Washington, D. C., says more displays will be held in Moscow but he has no dates or details.)

The Russian technicians declined to identify themselves or their affiliations during the interview but said they represented the Soviet aircraft industry, not the government. Two members of the Soviet contingent were from the embassy in Ottawa, but from six to eight others were from Moscow.

They first answered questions for AVIATION WEEK while touring U. S., British and Canadian aviation exhibits at the trade fair and then agreed to a later interview following the Canadian Air Show.

Red Progress

Asked about Russian advances in the aircraft and guided missile fields, one of the Soviet engineers commented: "Progress is coming along well." Pressed for details, he added, "Compare what you see here in Canada with what we will show in Moscow—that will indicate the progress of our industry."

Further questions brought a shake of the head and a "nyet," which there was no need to translate.

When asked to comment on the American displays, another of the Russians declared: "Everything we have seen is obsolete."

RUSSIAN OBSERVERS at Canada's National Air Show in Toronto look at a de Havilland Otter. Pointing out various features of the DH liaison plane is RCAF Flight Lt. C. W. Weir (extreme left). The Russians (left to right): V. Bugalski, G. Krutskyj and M. Shvets.

Their Canadian interpreter said, however, that comments between the engineers in Russian indicated the Soviet team was considerably more impressed with what it had seen of U. S. engines than was indicated.

The Russians were extremely thorough in their examination of aircraft and engines on static display. U. S. exhibits included the Martin Matador, Curtiss-Wright J65, General Electric J47, and Hughes Aircraft Co. radar fire control system, all of which drew great Soviet interest.

Detailed Sketches

The visitors from the Soviet Union spent the first day of the fair in a group tour and thereafter split up into small groups to return to those displays which interested them the most. Occasionally, they gathered at the fair's outdoor cafe to compare notes.

At the Curtiss-Wright exhibit, the Russians took photographs of the J65, made detailed pencil sketches of parts of the engine and asked technical questions. Fuel flow was of particular interest to them.

When Curtiss-Wright representatives Marty Vaness and Dan McElwain were asked what they told the Russians, they said the Soviets asked "very technical questions about our jet engines but we gave them no information that they could not get from reading newspapers or trade magazines."

The Russians carefully noted the rating of the J65 at 7,800 lb. thrust and then asked about the additional power supplied by the afterburner.

"We told them that figure was classified secret," Vaness said.

Examining the fuel pump on the J65, the Russians asked, "Do you subcontract your parts? Who makes your fuel pumps?"

Glenn L. Martin representatives said the Russians showed great interest in details of the B-61, comparing it to the V-1 and V-2. One Soviet engineer commented: "It is not complicated."

At Canadair's exhibit of an F-86 Sabre Jet and a cutaway T-33, four members of the Russian party asked if they might duck under the ropes and examine the aircraft more closely. Given permission, they peered into the tailpipe and airscoop of the Sabre. After a quick conference, their interpreter asked the Canadair representative if they might take off the cowling so that they could "see inside." The request was turned down politely.

When denied closer access to a display of radar fire control equipment, one of the Russians chortled, in English, "Secret, eh?"

Little Interest

Although the Canadian Air Show included more than 100 Canadian and U. S. aircraft, there was little in the aerial display to interest the Russians.

Most of the U.S. aircraft appearing were obsolete. The U. S. Navy sent over P4Y-2 Privateers, F4U Corsairs, a P5M Marlin flying boat, F2H

Banshees and F9F Cougars.

Only U. S. Air Force planes appearing were three F-86Ds. Fly-over of a B-47 Stratojet was canceled without explanation.

Asked after the air show if the Russians were disappointed with the display of obsolete aircraft, the leader of the Soviet delegation declared his pleasure at the exhibition and expressed the hope that the Canadians would visit the Russian Air show on June 19 "so that they can compare." He reiterated the intention of the Soviet Union to take part in next year's show.

He commented on the impressive aerobatic performance of the CF-100 but mentioned no other aircraft.

"Why should we be disappointed?" asked one of the Russians. But then he asked somewhat plaintively, "Why was the B-47 canceled?"

RCAF Demotes Air Vice-Marshal For Controversial AWA Speech

Toronto—Air Vice-Marshal John L. Plant of the Royal Canadian Air Force was demoted last week for remarks made before a dinner meeting of the Aviation Writers Assn. on June 2.

The government in Ottawa announced that Plant had been ousted from his post as RCAF Air Member for Technical Services and named head of the RCAF Air Materiel Command.

Whether similar action was planned against Air Marshal C. R. Slemon, RCAF chief of staff, was not announced. Both officers drew reprimands from the Minister of National Defense, Ralph Campney, for forthright statements made before AWA sessions.

The controversy was strangely similar to the U. S. situation in which high Air Force officers were chastised by the Defense Dept. for statements on Russian air power (AW June 6, p. 134).

Wrong Impression?

Air Vice-Marshal Plant was quoted in Canadian newspapers as calling for abolition of the Canadian Army to make more funds and manpower available for the RCAF. He also was quoted as saying that while war was inevitable, the west was "keen, anxious and willing" to take on the Russians and could "knock the hell out of them."

Many U. S. newsmen attending the convention felt that literal reporting in Canadian newspapers of Plant's remarks delivered in a humorous vein, gave a wrong impression of the speech.

Plant made it clear that he was not expressing government policy.

Prior to his appointment as Air Member for Technical Services, Plant was chief of staff to the commander-in-chief of Allied Air Forces in Central Europe.

No Army Comment

Lt. Gen. Guy Simmonds, chief of staff of the Canadian Army, called Plant's address "a very irresponsible speech on which I do not care to comment." The speech was front-page in many Canadian newspapers.

RCAF Chief of Staff Slemon also was criticized for telling AWA members that direction of the air defense of North America by one supreme commander from one headquarters is inevitable.

"Everything we are doing today is pointing in that direction," Slemon stated at RCAF Air Defense Command headquarters at St. Hubert." We have not arrived at it yet because there has been no inescapable need for it. But we will arrive at it in due course."

"All the planning, development, selection of weapons and all the decisions are aimed at the ultimate position of a supreme North American air defense command and everything that goes with it," he said.

Close Cooperation

Some observers felt the Ministry of Defense was irked at Slemon for letting news of the plan slip before diplomatic maneuvering had been completed.

RCAF officials and USAF officers from Continental Air Defense Command told AVIATION WEEK that the two commands already work together as one. "The decision has not been taken politically," said Slemon, "But it will be taken in due course. That is inevitable."

As with Plant's speech, Slemon's remarks drew front page attention and some criticism in Canadian newspapers. A Vancouver, B. C., newspaper ran a poll of local citizens opposing "merger of the RCAF with USAF."

AWA Elections

Toronto—Aviation Writers Assn. elected the following officers at its convention here last week: Vern Haugland, Associated Press, president; David Wallin, St. Louis Post-Dispatch, Ross Willmot, Hunting Associates, and George Rhodes, San Francisco Call-Bulletin, vice presidents.

William J. Coughlin, Aviation Week, was named regional director in Los Angeles.

Senators Urge More Titanium Research

Government funds should be channelled into research and development on titanium—to improve the product—instead of into increased production, according to a two-member subcommittee of the Senate Armed Services Committee.

The report by Sen. Stuart Symington (D.-Mo.) and Sen. James Duff (R.-Pa.) pointed out that government-subsidized facilities for titanium production will be able to produce 22,500 tons annually, but that consumption amounted to only 1,500 tons in 1954 and will amount to a total of only 1,700 tons in 1955.

Other subcommittee conclusions:

- **The government,** by assuming substantial risks in obtaining increased production of a product not yet commercially acceptable, "has cost the taxpayer many millions of dollars and may cost him a great deal more."
- **The aircraft industry's** interest in titanium "merits continued government support, provided that ultimately the metal can be made properly and produced at reasonable cost."
- **"More complete knowledge** of costs should be obtained from companies the government is subsidizing, especially as the price of the product depends partially upon the terms of the subsidy." The subcommittee observed that the government "knows very little about the actual cost of titanium production as against the sales price."

Moore Resigns Post As ACC Secretary

Lee Moore, executive secretary of the Air Coordinating Committee, resigned last week effective July 31 or an earlier date if a successor is named before then.

Moore told Louis S. Rothschild, Under Secretary of Commerce and ACC chairman, that ". . . log jams occasionally develop when there is wide division of statutory responsibility. At these times, action by the chairman to break, or at least expose, the interdepartmental snag is necessary. For this reason, even though the executive secretary impartially serves all agencies the same, the chairman should have complete confidence in him. Hence, I believe that you should nominate a man of your own choosing. . ."

Robert Murray, former Under Secretary of Commerce, selected Moore for the ACC post in January of last year.

Moore plans to remain in government work "to finish out a period of service to the Administration."

USAF Asks $356 Million to Rush B-52s

Washington D. C.—U. S. Air Force has asked Congress for $356 million to pay for accelerated production of the Boeing B-52 intercontinental jet bomber to meet the threat of growing Soviet air power (AW May 23, p. 12; June 6, p. 12).

The request, delivered to the Senate Appropriations Subcommittee on the Armed Forces by Defense Secretary Charles E. Wilson, would be added to the House-approved $5,950 million aircraft procurement budget for Fiscal 1956. It would increase the total for this purpose $206 million over the figure originally sought in President Eisenhower's budget.

At the same time, Wilson asked the group to restore $10 million cut from Defense Department's request for $35 million for emergency research and development projects. In addition to retrieving the amount reduced by the House, Wilson said he planned to transfer another $50 million to research and development from other funds.

This would give Assistant Secretary Donald Quarles a record amount for allocation to the armed forces. The emergency fund is used for any project that reaches the "breakthrough" stage and needs quick financial help to capitalize on the results.

While Congress prepared to act, USAF Secretary Harold E. Talbott appeared before the Senate Finance Committee in the face of sharp criticism from Democrats and assured them that USAF will have supersonic fighters ready to meet the Russian threat within the next two years.

While no action was disclosed for accelerating production as in the case of the B-52, Talbott's military aide, Brig. Gen. W. G. Hipps, said the secretary was referring to the "Century Series" of fighters now in production. This includes the North American F-100 Super Sabre, the McDonnell F-101, the Convair F-102A and the Lockheed F-104. Only the F-100 is in operational units and Wilson said USAF had not recommended a speedup in its output.

Confusion Over Funds

Earlier, Sen. Henry Jackson (D.-Wash.) said USAF does not have an interceptor that can deal with the new Russian bombers. Asked to comment, Wilson said he would ask Gen. Nathan F. Twining, USAF Chief of Staff, whether he has such an interceptor.

There was confusion over the money requested to speed B-52 production. On May 24, two days before the acceleration was announced, Wilson said he did not expect to ask for more appropriations.

Less than two hours after he asked the Senate committee to add $356 million to the budget, the Secretary had another news conference at which the following exchange took place:

Wilson Meets Press

Press: Could you tell us, sir, what you told the committee today?

Wilson: I don't think I could in the complete detail. What we were doing basically was discussing all of the questions that you always have when you wind up a budget discussion, and I went over there, along with a group of men from the Defense Department. I was really very well backed up. I felt quite comfortable. And I think we are going to get the thing all straightened out to everybody's satisfaction, or reasonably close to everybody's satisfaction.

Press: Mr. Secretary, it's been reported you asked for $356 million to accelerate B-52 production, is that . . .

Wilson: We have asked for a different allocation of funds to step up the production, that's true.

Press: Does it mean $356 million more next year than in your original budget?

Wilson: No, it doesn't.

Press: Could you say what it does involve in the way of . . .

Wilson: Well, I would rather someone else finally added that up, but the argument, or difference of opinion, seems to be whether we are going to ask for a bigger total budget than we asked for before, or whether we can do it within the limits of what we have asked for if they will restore some of the things the House talked about taking out of the budget. That's about what it amounts to.

Press: Well, it's $356 million more than passed the House, isn't it?

Wilson: Well, I can't be absolutely sure of that.

At another point this exchange took place:

Press: Mr. Wilson, put it this way—what they provide or what you ask in the way of new appropriations could be complicated about what they do about restoration of the House cut, but cashwise, if you speed up B-52 production as announced, would that involve additional sums of $356 million?

Wilson: If we did everything else just like we had planned to do, this would mean some more expenditure, because it's actually pulling into the '56 year some additional production.

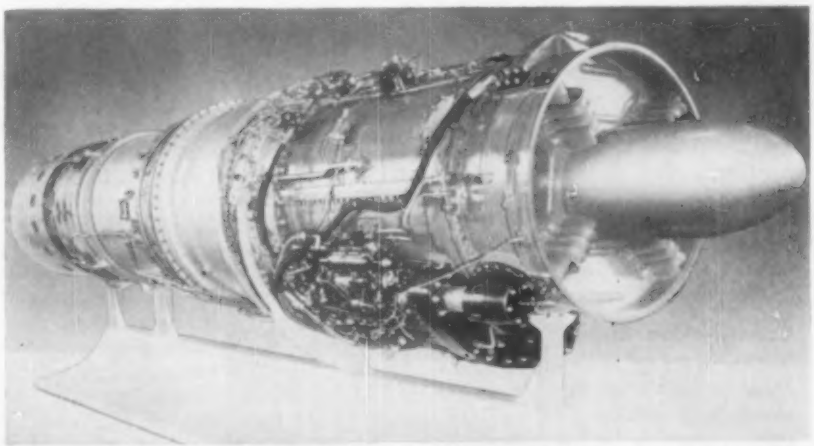
Congressional Criticism

Meanwhile, members of Congress were watching Pentagon developments.

Sen. Jackson said the Defense Department "has not been candid with the American people on the growing threat of Soviet air power. There is no question about it."

Criticizing Wilson for withholding facts only 48 hours before the B-52 program was accelerated, Jackson said "the Pentagon engaged in a half truth. We do have air superiority as of the moment, but the situation will be lost unless the aircraft production of the United States is increased substantially. Unless we step up substantially our jet aircraft production of all kinds, the Soviet Union will surpass us. Today, the Soviet Union has more jet airplanes of all kinds than the U. S. and that more is in terms of thousands."

Sen. Stuart Symington (D.-Mo.), former USAF secretary, said the entire



WRIGHT J65 WITH AFTERBURNER will be viewed by public for the first time during Paris International Aviation Exhibition June 10th-19th at Le Bourget Airport. Power rating of the engine, installed in the supersonic Lockheed XF-104 and Grumman F11F-1, is classified. The basic Wright J65 without afterburner produces 7,200-7,800 lbs. thrust.

program must be accelerated or Russia "will surpass us in a short time."

Rep. Daniel Flood (D-Pa.) made a strong issue of Defense Department reversals, calling it the "off-again, on-again Finnegan defense policy of appropriations." He said flatly that Wilson now wants $356 million more than he said he wanted when the House passed the defense appropriation bill.

Senate Unit Restores $8.8 Million Cut by House to NACA's Budget

Washington, D. C.—Senate Appropriations Committee has voted National Advisory Committee for Aeronautics its full budget request of $76.5 million for fiscal 1956, restoring an $8.8-million House cut.

NACA's chairman, Dr. Jerome Hunsaker, called the House action "alarmingly inconsistent with the realities of the international situation. By retarding scientific research at this time, we are risking early obsolescence of the nation's air forces."

He added: "Research needs of our immense air program are critical. Unit costs of research projects have increased while unsolved questions before NACA have multiplied.

"The recent trend toward leveling off the funds appropriated for scientific research in aeronautics is forcing the NACA to defer basic investigations of great potential value."

The $76.5 million approved for NACA is $20.6 million more than the fiscal 1955 budget. This will provide for an acceleration of research effort and operation of three new wind tunnels that will come into operation during the coming year.

Flanders' Recommendations

A report submitted to the Appropriations Committee by Sen. Ralph Flanders, who made an investigation of NACA activities for the Armed Services Committee, "strongly recommended" restoration of the House cut.

Flanders' report said: "The NACA is not able to do as much research as it would like to do, nor as much as the military and private aviation would like to see it do.

"But the distinguished group of unpaid citizens comprising the main committee of the NACA, together with the Bureau of the Budget and the President, have agreed upon for the coming fiscal year a somewhat expanded program utilizing the new facilities coming into operation, and the judgment of these men is worthy of confidence."

Construction Budget

The $13 million earmarked for new construction in NACA's budget includes $4.8 million for a nuclear propulsion research facility to test the effects of radiation on structural materials, moderators, coolants, fuel materials and aircraft instruments and equipment. It will be located at the Lewis Flight Propulsion Laboratory in Cleveland. Acquisition of approximately 500 acres for the facility is planned.

Other projects provided for include:

Langley Aeronautical Laboratory, $3.3 million for an air-removal system for the 16-ft. transonic tunnel to extend its speed range to include Mach 1.2 for the testing of aerodynamic characteristics that become critical in the low supersonic speed range with large-scale models.

Ames Aeronautical Laboratory, $635,000 for a high-speed free-flight facility for investigation of aerodynamic heating, loss of surface materials and retardation of missiles in the speed ranges from Mach 9 to Mach 18.

Lewis Flight Propulsion Laboratory, $2.6 million for conversion of the 8-by-6-ft. propulsion tunnel to transonic operation for research on powerplant installations through the entire range of speeds from low transonic to Mach 2. The tunnel is now limited to a range from the high transonic speeds to Mach 2.

NWA Moving Shops To Wold-Chamberlain

Northwest Orient Airlines will consolidate its overhaul and operational headquarters in a new building to be constructed at Wold-Chamberlain field in Minneapolis. The new facilities will cost between $14 million and $15 million and are expected to be completed by the end of 1956.

NWA's move will be a part of the $28.8-million expansion of Wold-Chamberlain by the Minneapolis-St. Paul Metropolitan Airports Commission. In other proposed projects, the commission is negotiating with:

- **North Central Airlines** for construction of a $2-million overhaul and maintenance base at the airport.
- **Western Airlines** to build a $400,000 hangar at the eastern terminal of WAL's Minnesota-California route.

Northwest will pay for its permanent headquarters under a proposed 30-year agreement that will include fees for use of the airport. Discussions were under way last week between NWA and the airport commission on terms of the lease.

One major working condition is acquisition of a 76-acre site for the airline's facilities. The land, adjacent to Fort Snelling, now is owned by the federal government.

Both Northwest President Donald W. Nyrop and Lawrence Hall, chairman of MAC, predicted details of drafting the final lease and plans for the building would be completed in the near future.

Preliminary designs of the new facility call for approximately 800,000 sq. ft. of hangar, shop and office space. It will put under one roof NWA's overhaul base.

Army Activates First Fixed Wing Plane Unit

U. S. Army is activating its first fixed wing tactical transport aviation company at Ft. Riley, Kan. The unit, at full strength, will be equipped with 21 de Havilland U-1 Otters.

Almost simultaneous with the announcement, a new training circular was issued defining the primary function of Army transport aviation as combat support.

"Army transport aviation units are organized and are assigned within the Army," the circular says, "to provide the ground commander with a means of attaining increased mobility in the combat zone."

The circular recognizes the de Havilland U-1 as the standard fixed wing transport, supplementing light, medium and heavy helicopter companies.

In combat, the Army envisions the aircraft carrying out the missions necessary to modern warfare with emphasis on mobility in the combat zone. In addition to simple logistics, these missions will include:

- **Exploiting** the effects of nuclear weapons.
- **Skipping** over barriers to seize an objective.
- **Striking** the enemy in the rear or flank.
- **Expediting** movement of armored or motorized forces.
- **Observing.**
- **Covering** a withdrawal.
- **Moving** reserves.
- **Enveloping** of beach defenses.

In the field of service support, aircraft will be used to augment or replace ground communication, under control of the headquarters responsible for logistics.

The single-engine de Havilland aircraft will be allocated to the new 14th Aviation Company out of the initial order of 90 on which deliveries have been started.

Authorized personnel for the 14th Army Aviation Company will be 45 officers, 59 enlisted men and one warrant officer. The unit is assigned to the Fifth Army.

"They've designed the guesswork right out of this fuel pump."

(The fuel systems engineer meant Hydro-Aire's new HY-V/L* pump: the only pump with Design Predictability.)

"I knew the people at Hydro-Aire had developed a new fuel booster pump; and I'd heard about the fact that it's more efficient because it doesn't need the old vapor separator.

"But when they talked about Design Predictability I didn't get it...at first. So they asked us to call a meeting of the whole group...and in less than forty-five minutes they briefed us on an entirely new method of determining pump specifications. Takes all the old "guesstimating" out of writing a set of pump specs!"

The new HY-V/L* pump has many advantages: it is lighter and more compact; it can handle large quantities of fuel vapor *without* separation; it has excellent climb performance; since it does not use a vapor separator it doesn't need the additional power required to drive it.

But the most important feature of this new pump is *design predictability,* because this feature has made possible an entirely new concept of determining pump specifications. You, the systems engineer, can call your exact shots with this method. You no longer have to pay the inevitable weight and power penalties that occur when a shelf item is modified.

It takes forty-five minutes to explain this method. Hydro-Aire is currently arranging these presentations with Engineering managements of airframe companies throughout the country. For further information please contact your Hydro-Aire Sales Engineer.

**High Vapor/Liquid Ratio*

HYDRO-AIRE *Inc.*
3000 WINONA AVENUE, BURBANK

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CONVAIR "SEA DART"
Water-based fighter

The Latest

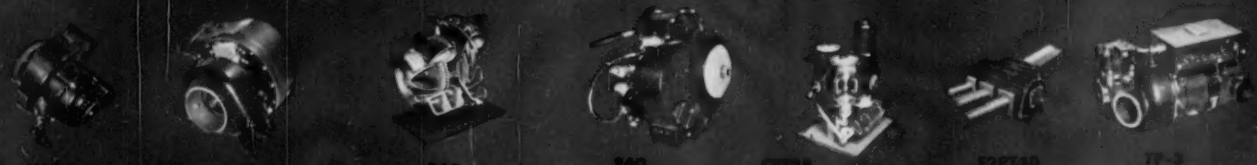
DOUGLAS X-3
Designed for research into problems of very high speed flight

ARE AIR-

Stratos is proud to have designed and supplied equipment for these outstanding aircraft. America's newest research plane — the latest USAF and US Navy fighters — our first line medium and heavy jet bombers — are air-conditioned by Stratos.

Designing and producing the best in pneumatic aircraft accessories is Stratos' business. Equipment for aircraft of the future will be designed, developed and produced by Stratos to meet the demands of higher flight speeds and operational altitudes.

Typical STRATOS Products



#15 — Air Cycle Refrigeration System

N100 — Air Cycle Refrigeration Unit

B60 — Bootstrap Air Cycle Unit

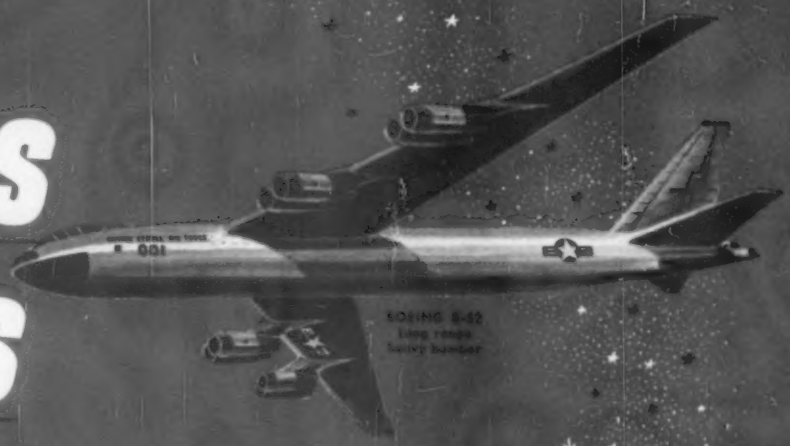
B60 — Cabin Supercharger

CPT25 — Main Flow Valve

F2PT40 — Mechanical

TF-3 — Turbine Drive

BOMBERS
FIGHTERS
RESEARCH PLANES



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TP15-0
Air Turbine Drive
for 9 to 12 kva Alternators

TP15-1
Air Turbine Drive
Air Starter for Turbo Jets

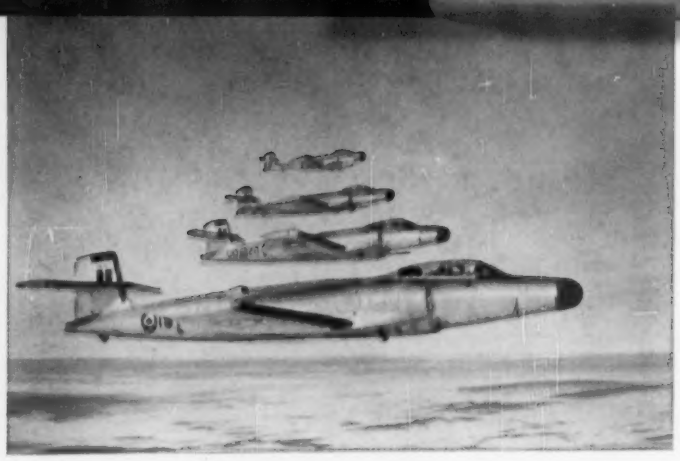
TP25
Air Turbine Drive
for 15 to 25 kva Alternators

M550
Air Mass Flow Sensor
Rated Air Flow—60 lbs/min

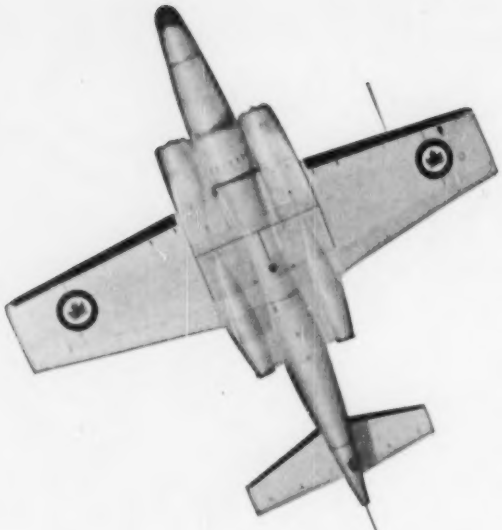
EA60-2A
Refrigerating System
Controlled Discharge Temperature

EA60-1A
Refrigeration System
Controlled Discharge Temperature

CF-100's in formation on winter patrol over Canada's Northern approaches.



. . . in England now



Three CF-100 all-weather interceptors recently flew the Atlantic and are now on evaluation tests with the R.A.F. in England.

In that swift crossing, Avro Aircraft reversed the trend of aeronautical development to place at the disposal of the R.A.F. the world's outstanding all-weather interceptor.

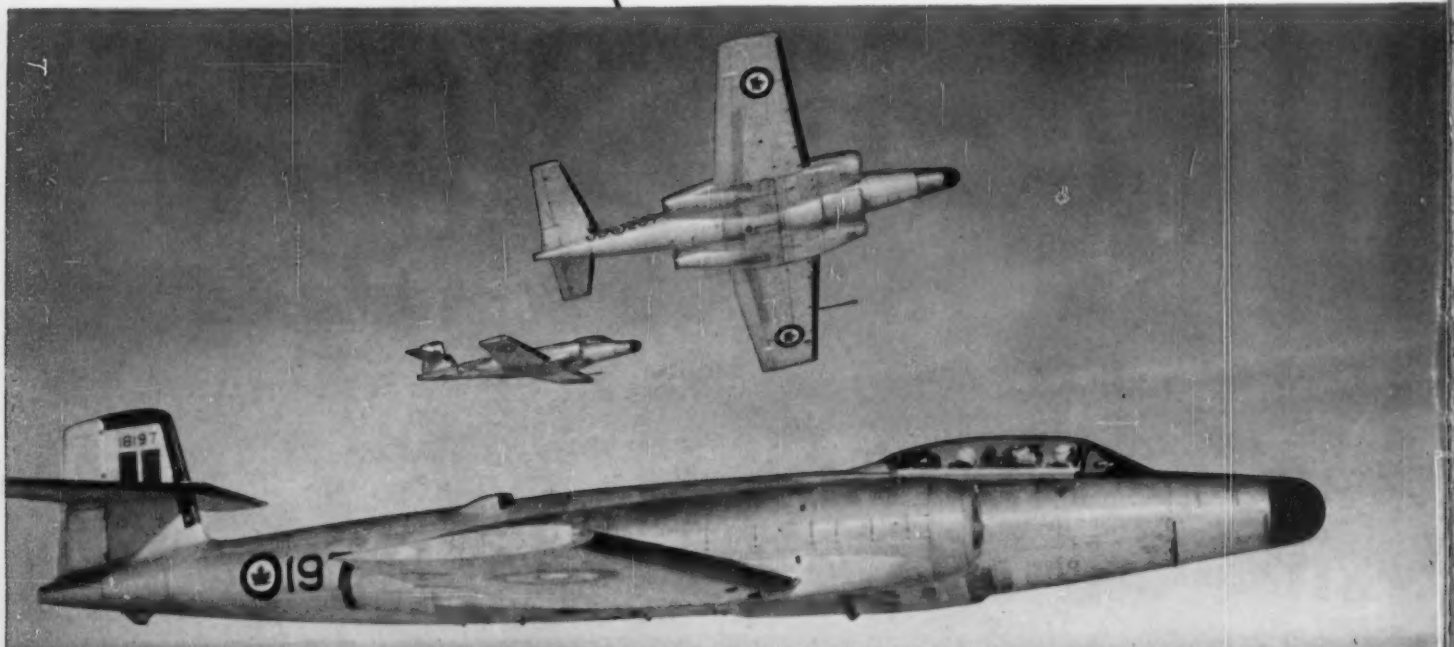
Additional evidence of the serviceability and performance of the CF-100 is its unanimous selection to equip by 1956, four R.C.A.F. squadrons to strengthen the all-weather defence capabilities of NATO in Western Europe.

Avro Aircraft, as one of the main industrial arms of the R.C.A.F., is constantly at work reinforcing and maintaining the air defence of the free world.

AVRO AIRCRAFT LIMITED MALTON, CANADA

A. V. ROE CANADA LTD.—MEMBER, HAWKER SIDDELEY GROUP

Three CF-100's flew the Atlantic in March and four R.C.A.F. squadrons will be on duty over Europe in 1956.



ENGINEERS NEEDED! Aeronautical, mechanical and electronic engineers are needed by Avro Aircraft Ltd. to help meet the increased demands of the Jet Age. Your training and skills can assure you of a highly paid future with Canada's expanding aeronautical leader. Write to Personnel Manager, Avro Aircraft Ltd., Malton, Canada.

Avionic Components Neglected

Los Angeles—Long-term development of avionic components is endangered by a Department of Defense tendency to emphasize end items such as complete weapon systems.

This view was expressed by Dr. Ivan A. Getting, vice president-engineering and research of Raytheon Mfg. Co., one of the participants in the Electronic Component Conference held here recently. More than a thousand scientists, engineers and technicians attended the two-day sessions.

Dr. Getting told AVIATION WEEK that the time cycle for development of avionic components is too long to fit into the weapon system schedule. Continued and more extensive military support for research and development of components is required to assure timely volume production and readiness for service use, he believes.

Military Incentive

Still the Department of Defense has spent at least 10 times as much on component R&D as the commercial and industrial fields combined, he said.

"This research and development is required because in military applications the incentive is to advance the scientific and engineering frontiers to keep qualitative superiority over an enemy," Getting emphasized.

Qualitative superiority means smaller, more uniform, more reliable components; higher power; lower noise levels; more standardization; and capability for improved mass production.

Full development of these characteristics cannot be supported by normal commercial incentive, Getting said.

The gap between avionic research and development and production status can be closed by proper government support, particularly with production refinements and reasonable quantity procurement.

"These two factors," Getting told AVIATION WEEK, "will aid in establishing specifications and introducing components to prospective designers of military equipment."

Incomplete Cycles

The situation now is that components often are used which have not gone through a completed development and production cycle, introducing waste, operating difficulties and spares problems, he said.

One example in which the military did a good job of anticipating its future needs has been the transistor. It spent millions of dollars on transistor research and development and more millions on production refinement contracts, without end items in mind, Getting pointed out.

Even with this planning it will be 10 to 15 years before there is a substantial amount of military equipment incorporating these transistors, he believes.

The military approach on transistors was good foresight, Getting said. "We need more of this and it should be applied to other developments such as magnetic components, ferrites, high-power tubes and new materials."

MILITARY AVIATION FUNDS

The three services have more than $7.4 billion in unobligated funds for new orders of aircraft, aircraft engines, guided missiles, electronics and related procurement on April 1. Net obligations (new contracts minus cancellations) during the first three quarters of fiscal 1955 totalled more than $5.1 billion. Here are the details.

OBLIGATIONS
(In Millions)

	Obligations July 1 through Mar. 31	Unobligated balance Apr. 1
Aircraft, engines and parts		
Air Force	3,065	4,790
Navy	622	1,125
Army	124	99
Total	3,811	6,014
Guided Missiles		
Air Force	390	321
Navy	94	100
Army	246	178
Total	730	599
Electronics and communications equipment		
Air Force	453	555
Navy	71	106
Army	51	135
Total	575	796
Grand Total	5,116	7,409

EXPENDITURES
(In Millions)

	Expenditures July 1 through Mar. 31	Unexpended balance Apr. 1
Aircraft, engines and parts		
Air Force	4,688	11,993
Navy	1,261	5,249
Army	38.7	360
Total	5,987	17,602
Guided Missiles		
Air Force	206	785
Navy	129	391
Army	41	628
Total	376	1,804
Electronics and communications equipment		
Air Force	313	1,183
Navy	125	397
Army	60	410
Total	498	1,990
Grand Total	6,861	21,396

Still gets that wonderful feeling . . .

"After 9 years of flying behind many Airwork engines, I still get that wonderful feeling that they are completely dependable. This confidence has been justified many times by their performance.

After looking over other deals, I'll still stick to Airwork as my factory authorized overhaul agency — *and fly with that wonderful feeling!"*

Charles F. Sowa

Chief Pilot

Virginia Coal & Iron Company

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BUCKET BRIGADE

Jet airpower is the backbone of America's defense, and jet engines depend upon scientifically exact turbine vanes, turbine blades and supercharger buckets for power and performance.

To mass-manufacture these vital precision parts, Austenal applies the ancient "lost wax" method of investment casting, greatly improved and now called Microcast—a technique so precise and so accurate that Austenal turbine buckets and vanes eliminate costly machining and require only a minimum of finishing.

The Microcast process was developed by Austenal, and its use in the manufacture of vital jet components is only one of many applications. In every field of industry, Microcast is proving that complex, intricate metallic parts can be made better and more economically by investment casting.

Let Austenal show you how Microcast can help brighten your production picture.

See Austenal's original informative 16mm color movie, "A Story of Industrial Progress". Available without charge.

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Talbott Reassures SDIA on Dispersal

Los Angeles—USAF dispersal policy should not affect small defense firms located on the West Coast, Air Force Secretary Harold E. Talbott has assured the Small Defense Industries Assn.

"I do not believe this dispersal policy should affect small business or subcontractors in any way," Talbott stated in a telegram to the SDIA.

The association had tabulated numerous cases of discrimination against small West Coast firms which were reported to Edmund L. Hartung, Talbott's deputy assistant for materiel.

"This situation was unknown at the level of the Secretary's office and will be investigated immediately," Hartung told SDIA executives. He pointed out that some contracts may contain clauses prohibiting West Coast assembly, but "if such clauses do exist, they should not extend to subcontract purchase of components or other small business participation."

Hartung said an effort would be made to advise prime contractors not to withhold orders from small business because of location.

ODM Grants Writeoffs To Aviation Firms

Columbia Southern Chemical Corp., Natrium, W. Va., has been granted a $5.5-million certificate of necessity by Office of Defense Mobilization for a titanium tetrachloride facility with 90% of the amount allowed for rapid tax amortization.

Other certificates recently issued include:

Collins Radio Co., Cedar Rapids, Iowa, electronic equipment, $93,512 certified with 65% allowed.

Robert H. Brooks Co., Rockford, Ill., military aircraft parts, $97,010 certified with 45% allowed.

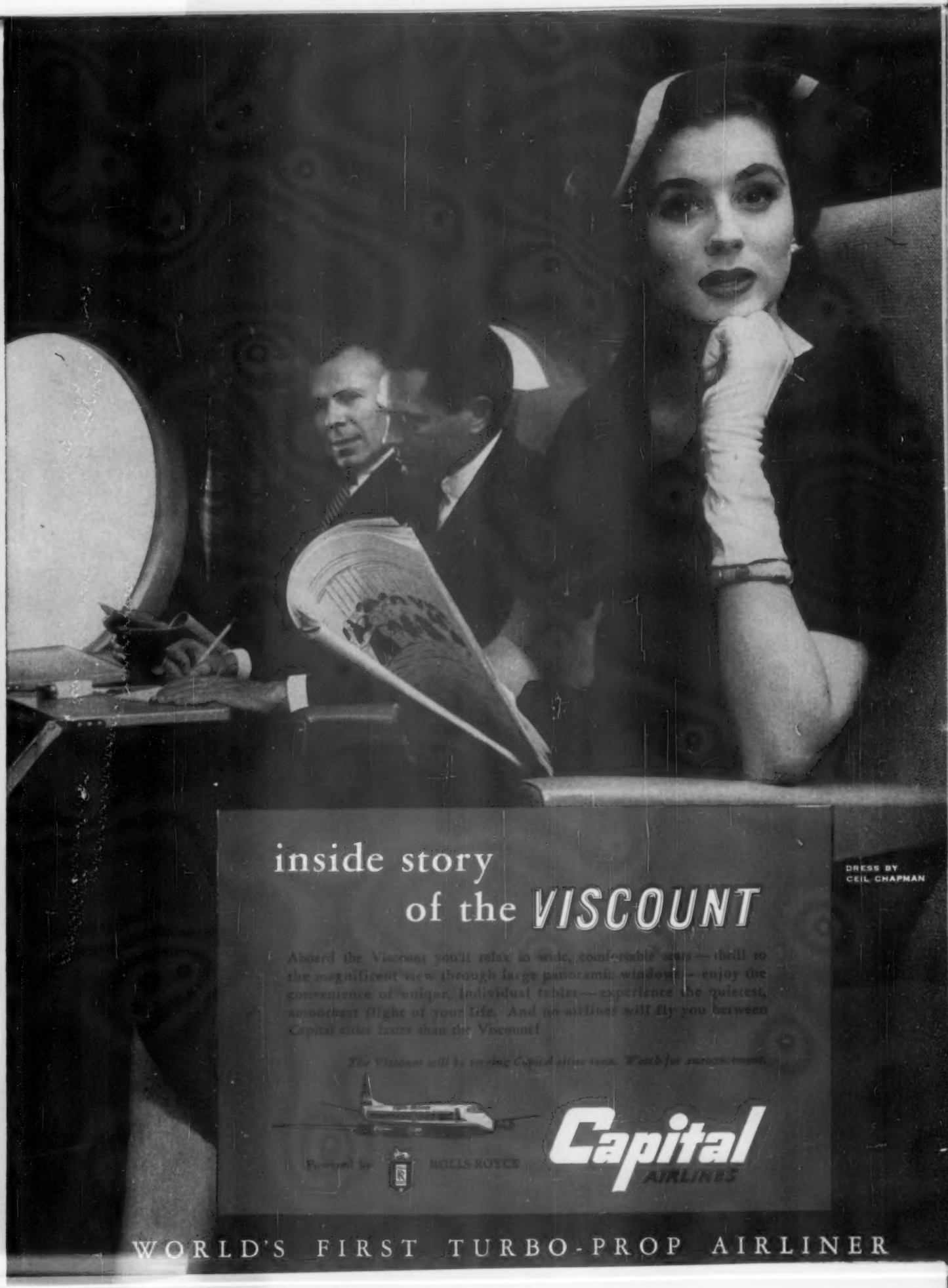
Glenn L. Martin Co., Baltimore, Md., military aircraft, $460,500 certified with 60%

Five-Fold Increase

Montreal—Airfreight volume will increase five-fold in Canada in the next decade and airline passenger travel will double, forecast R. N. Redmayne, general manager of the Canadian Industries & Transport Assn., at the annual convention of the Canadian Manufacturers Assn.

Railways and steamships, once leaders of commerce, now are only followers, he said.

Passengers and cargo now traveling on surface carriers soon will move in great numbers to air transports.


inside story
of the VISCOUNT
Aboard the Viscount you'll relax in wide, comfortable seats — thrill to the magnificent view through large panoramic windows — enjoy the convenience of unique, individual tables — experience the quietest, smoothest flight of your life. And no airliner will fly you between Capital cities faster than the Viscount!
The Viscount will be serving Capital cities soon. Watch for announcement.
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Here's a tailor-made way out...

CEC's new DataTape

If data reduction is slowing down your development program, here's good news. Consolidated Engineering . . . world leader in flight-test instrumentation . . . now brings you "DataTape," a really new magnetic-tape recording system. Designed specifically for data recording, DataTape is ideal for engineering flight testing . . . *because it was designed that way right from the drawing board.*

DataTape flight-test data can be scanned and evaluated automatically . . . yields *reduced* data in a fraction of the time needed for manual reduction of oscillograph records. Playback equipment can be tied directly to digitizing equipment . . . such as CEC's MilliSADIC . . . and thence to digital computers, if desired, for virtual elimination of the human factor in data processing. It's an ideal way out of one of modern aviation's most serious bottlenecks . . . engineering data reduction.

RECORDER

Data Channels . . . 12 or 24 standard, plus 1 flutter-control track and 1 time or voice track per 12 data channels.

Tape Speeds . . . 10, 20 and 40 in/sec; or 7½, 15 and 30 in/sec.

Recording Time . . . 43 minutes at 10 in/sec; 57 minutes at 7½ in/sec.

Flutter . . . less than 0.2% peak to peak (0.08% rms) over 5 to 300 cps band @ 10 in/sec. Mechanical flutter compensation on playback reduces this figure to 0.1% peak to peak (0.04% rms) in 0 to 20 cps range; electronic system compensates for flutter at higher frequencies.

Power . . . 115 volts, single-phase, 50/60/400 cps; 275 watts.

Size . . . 7 x 22 x 11¾"; 60 pounds.

Controls, indicators . . . all on top plate. Warning lamps indicate data loss from mechanical or electronic failure.

RECORD AMPLIFIER*

Channels . . . 14 or 28, including flutter-control, range-time and voice-recording tracks.

Frequency response . . . without modulators, flat ±1.6 db 300 to 18,000 cps @ 10 in/sec and 300 to 36,000 cps @ 20 in/sec; flat ±2.3 db 300 to 60,000 cps @ 40 in/sec.

Signal Input . . . 0.50 volts full scale; channel input impedance to attentuator 100,000 ohms.

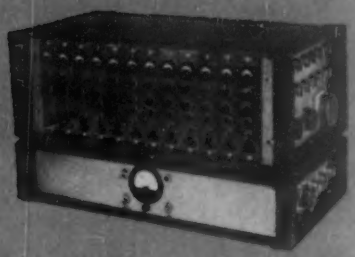
Power . . . 115 volts, single-phase, 50/60/400 cps; 225 watts.

Size . . . 5⅞ x 22 x 11¾"; 35 pounds.

*Unit contains own data-channel amplifiers, power supply, bias and flutter-control oscillators, and microphone amplifier.

RECORDER

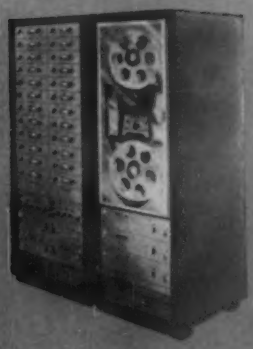
RECORD AMPLIFIER AND RECORDER



SIGNAL MODULATOR

AUTOMATIC CALIBRATOR

RANGE-TIME GENERATOR



PLAYBACK EQUIPMENT

SIGNAL MODULATOR

Contains up to 12 plug-in modulators per case for amplifying and "coding" signal input voltages to a form adapted to precision magnetic-tape recording. Each channel accommodates either: (a) direct-recording input unit, (b) combination compound-modulation/frequency-modulation (CM/FM) modulator or (c) pulse-duration modulator (PDM). Separate power supply provides all voltages for 12 modulators plus AM carrier for CM recording.

Power . . . 115 volts, single-phase, 50/60/400 cps; 250 watts.

Size . . . (a) 12-channel modulator case: 7⅝ x 22 x 11¾"; 53 pounds.
(b) power supply: 4⅛ x 22 x 11¾"; 50 pounds.

AUTOMATIC CALIBRATOR

Provides "in-flight" calibration for both bridge-type and self-generating transducers and for thermocouples. Signals supplied to 12 data channels simultaneously; two units used for 24-channel system. Zero check plus two positive and two negative calibration values provided for bridges and thermocouples; zero check and two amplitude levels for vibration pickups. Calibration of 12 channels completed in one second under automatic cycling control. Manual control permits calibration at chosen periods.

Power . . . 115 volts, single-phase, 50/60/400 cps; 75 watts.

Size . . . 4¼ x 22 x 11¾"; 45 pounds.

RANGE-TIME GENERATOR

Provides visual display of tuning-fork-controlled time at the recording equipment and at the remote control station. Also provides binary-coded-decimal time signal for recording on the magnetic tape and for use as a master time signal to control or operate counters, solenoids, etc. Slightly over 27 hours . . . 99,999 seconds . . . can be accumulated and indicated.

Power . . . 115 volts, single-phase, 50/60/400 cps; 100 watts.

Size . . . 4¼ x 22 x 11¾"; 35 pounds.

PLAYBACK EQUIPMENT

Standard rack-mounted playback equipment can be operated in the laboratory or trailer-mounted for field use. One cabinet houses tape-transport assembly and equalizing preamplifiers. (Servo-operated flutter-correction equipment available for compensated playback.) Second cabinet houses demodulation electronics for recovering original signals. Interchangeable demodulators, matched to the modulation technique used in recording, may be inserted into each channel drawer. Resulting signals can drive galvanometers, oscilloscopes, chart recorders . . . or automatic digital-conversion devices, such as the CEC MilliSADIC.

Power . . . 2400 watts for typical 24 data-channel system.

Consolidated's experienced Field Engineers and its Systems Division are ready now to show how Data-Tape can serve you. Write today to Pasadena or to any CEC local office for Bulletin CEC 1561-X3

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In today's jet age, each new plane poses unique problems for the pilot, and calls for additional training. ERCO tackles these tough assignments . . . by developing and producing flight simulators that simplify the pilot's job and make his training easier.

From the conventional propeller-driven plane to the latest jet, ERCO has built simulators for 17 different types of military aircraft. These all-electronic wonders are at work throughout the country . . . saving the military *lives, time* and *dollars*.

Make ERCO your scientific research department — your engineering staff — your extra plant when the job calls for:

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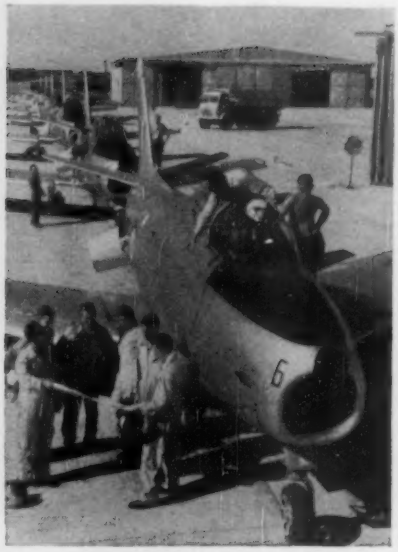


Aussie Sabres

Royal Australian Air Force is beginning to receive "considerable numbers" of Australian built versions of the North American F-86 Sabre. Fighters shown at Sabre Trials Flight, Williamstown, New South Wales, were manufactured by Commonwealth Aircraft Corp. and are powered with an Australian-manufactured Rolls-Royce Avon engine. RAAF has 90 Avon-Sabres on order to equip its 18th Wing.

allowed; military aircraft, $73,213 certified with 65% allowed.

Kuthe Laboratories, Inc., Newark, N. J., electronic parts, $46,100 certified with 70% allowed.

Stiger Precision Products, Inc., Chicago, Ill., aircraft parts, $48,302 certified with 70% allowed.

Electric Tachometer Corp., Philadelphia, Pa., scientific instruments, $70,000 certified with 50% allowed.

Bell Aircraft Corp., Ft. Worth, Tex., military aircraft, $34,800 certified with 60% allowed.

D. S. Kennedy & Co., Cohasset, Mass., electronic parts, $325,000 certified with 45% allowed.

Jarvis Manufacturing, Inc., Wichita, Kan., aircraft parts, $89,461 certified with 45% allowed.

Bendix Aviation Corp., Bendix Products Division, South Bend, Ind., military aircraft fuel systems, $692,840 certified with 60% allowed.

Lockheed Aircraft Corp., Burbank, Calif., military aircraft, $119,588 certified with 60% allowed; military aircraft, $370,391 certified with 65% allowed.

United Aircraft Corp., Hamilton Standard Division, Windsor Locks, Conn., military aircraft components, $171,205 certified with 60% allowed.

Northrop Aircraft, Inc., Hawthorne, Calif., military aircraft, $36,655 certified with 65% allowed.

General American Transportation Corp., Pasadena, Tex., aviation gasoline storage facilities, $760,000 certified with 65% allowed.

General Precision Laboratory, Inc., Pleasantville, N. Y., research and development test facilities, $22,473 certified with 65% allowed.

Fairchild Engine & Airplane Corp., Stratos Division, Bay Shore, N. Y., military aircraft parts, $66,418 certified with 65% allowed.

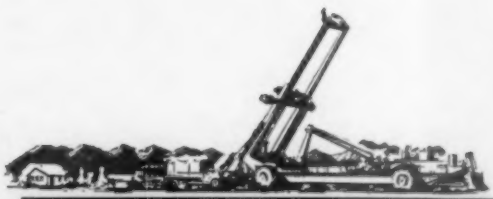
Kearfott Company, Inc., Little Falls, N. J., precision military aircraft instruments, $109,095 certified with 65% allowed.

Since the beginning of time man has sought to escape the limitations of the known. Though his feet are planted on the ground, his vision goes beyond the range of sight to limitless space . . . dwelling place for a hundred million universes.

Exploring these realms of the unknown . . . wresting the electron's secrets from Nature has been Farnsworth's sole function for over a quarter of a century . . . the last ten years continuously participating in the design, development and production of guided missile systems such as Talos, Terrier, Sparrow and others.

We hope our contributions to this country's defenses act as deterrents to aggression and help influence the peaceful settlement of differences between nations.

The next decade, added to this vast storehouse of electronic knowledge, will bring man's age-old vision of reaching the stars into closer focus.



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AERONAUTICAL ENGINEERING

NACA Flies VTOL Transport Model

A four-engined VTOL transport model, part of the National Advisory Committee for Aeronautics' continuing research program on vertical-rising aircraft, has been test-flown by scientists at NACA's Langley Aeronautical Laboratory.

Vertical lift of the model comes from the propeller slipstream, turned through 70 deg. by a system of vanes that retract to form a monoplane wing. The model is a highly developed version of an early NACA test vehicle demonstrated at the 1953 Langley inspection (AW May 18, 1953, p. 16).

Three pilots, one for control about each of the stability axes, put the one-tenth-scale model through its paces in hovering tests earlier this year. Next scheduled phase of their work is the transition flight from vertical to horizontal flight.

Flying characteristics so far determined are not outstanding; without automatic control, stability would be a problem in both pitch and yaw. But for a first step toward solving an extremely difficult engineering problem, these NACA model tests have given excellent and exciting results.

Other experiments by NACA in its 10-year program of vertical flight research have included pioneering work by Charles H. Zimmerman and his associates on "flying platforms" (AW Apr. 25, p. 44) and development work on the Lockheed and Convair VTOL configurations, both at Langley and at Ames Aeronautical Laboratory (AW Apr. 26, 1954, p. 30).

VTOL TRANSPORT MODEL hovers in clearing during outdoor phase of flight tests.

Flaps and Vanes

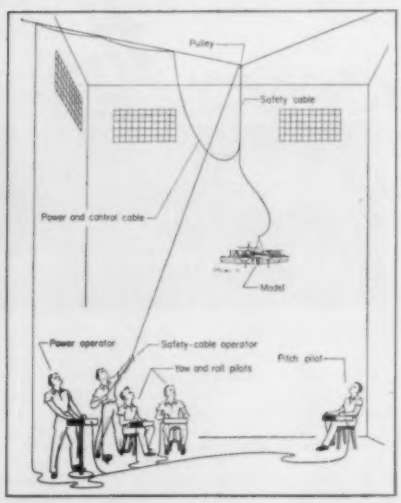
NACA's test model is dynamically similar to airplanes in the Convair 240 or Vickers Viscount category, although it represents an airplane smaller than either one. Passenger capacity of the full-scale airplane could be 40 people.

Most of the turning vanes and the wing are submerged in the slipstream from the four propellers, mounted with thrust axes parallel to the fuselage centerline. Eight 90-deg. vanes are evenly spaced in a cascade above the wing surface; first tests of the model were made with eight additional vanes below the wing, but these were later discarded as unnecessary.

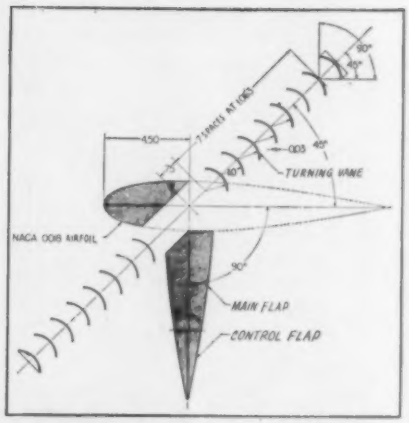
There is a full-span plain flap of 65% chord that can be deflected through 90 deg. for the hovering condition. Trailing quarter of this flap is hinged as a control surface.

Normal position of the cascade for hovering is in a plane at 45 deg. to the wing chord plane. During transition flight, while flaps retract from 90 to zero degrees, the cascade rotates forward through 45 deg. so that it is perpendicular to the wing chord.

From that position, it retracts by swinging outboard as a parallelogram configuration and fits into a recess on the upper surface of the wing. This system was designed for optimum



TEST TECHNIQUE requires five-man team to fly the model, operate power and monitor safety. Tests were made indoors and out.



WING SECTION with vanes extended shows geometry of retractible-vane layout.

model conditions, and is not suggested as optimum for the full-scale airplane.

Control system differs from conventional aircraft because there is no usable free-air slipstream to react against conventional rudder, elevators or ailerons. "Rudders" of the model during hovering are the trailing-edge flap controls, moved differentially. If those same surfaces are operated together, they act as elevators and control the aircraft around the pitch axis.

For roll control, the total pitch of the two outboard propellers is varied differentially; this produces a change in propeller thrust that, turned by the vanes, becomes a difference in lift to produce a rolling moment.

A five-man crew was used for the flight tests. In addition to the three pilots, one man operated the power controls, and the fifth was a standby to haul on the safety cable if trouble developed in flight.

The standard techniques developed for free-flight tests were used; model tests were made indoors in the large room used at Langley, and others were made outdoors in a clearing in the woods.

Vertical takeoffs and landings, hovering close to the ground and hovering at a considerable height were programmed during the tests. An artificial stabilizing device was used during some of the tests to increase damping in pitch.

Flying qualities were assessed from pilots' comments, from motion pictures of the flights and from measurements made from the motion pictures.

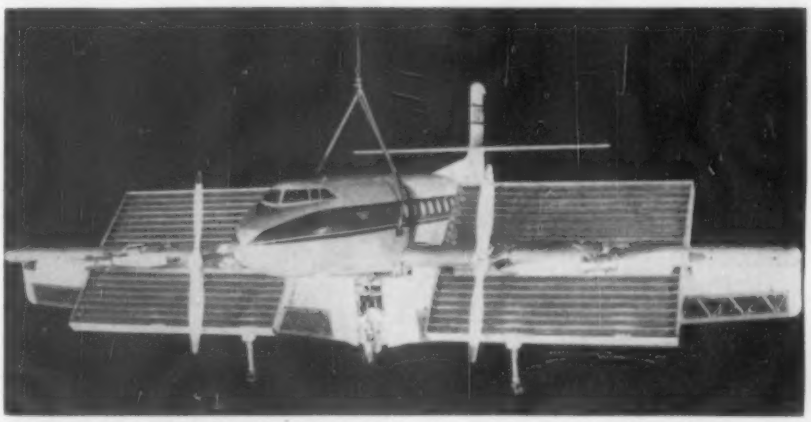
Takeoffs and Landings

An upflow at the horizontal tail marred the early takeoffs made with the model; the tail tended to rise and the model accelerated forward before it left the ground.

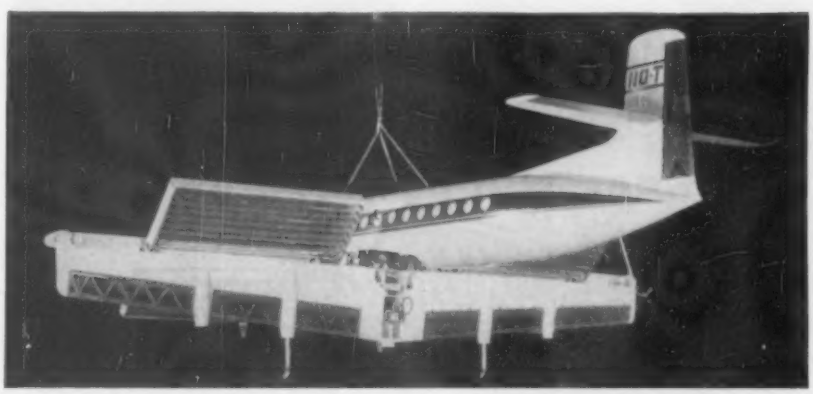
This was cured in subsequent flights by dropping the position of the horizontal tail to the fuselage centerline—it had been originally mounted well up

How NACA Applied Vanes, Flaps to VTOL Model . . .

RETRACTED VANES fit within recess in upper surface of model wing.



UPPER AND LOWER VANES, eight each, were used in early tests of model.



FINAL CONFIGURATION of VTOL transport model used only upper turning vanes.

the fin—and giving the tail a negative incidence of 35 deg. and an up-elevator deflection also of 35 deg. This, says the NACA report, effectively eliminated the tendency for the tail to rise.

The low-set tail made takeoffs and landings simple and easy. If the model were properly trimmed for hovering flight well off the ground, then as it neared or left the ground it still showed a tendency to move forward. This was attributed to a slight reduction in the turning angle of the slipstream, which tilted the force vector forward a little.

In a full-scale airplane, this would not be difficult to control, because the pilot would have a proportional control system. Model tests were all made with flicker-control systems, pneumatically operated to give either zero or full deflection of the surface.

Violently unstable pitch oscillations

showed up in hovering flight well off the ground. They combined pitching and longitudinal motion which gave the model a tendency to pitch nose-up if it moved forward, or nose-down if it moved backward. But it also had a tendency to move forward if it pitched nose-down.

These two sets of reactions produce—in theory—static stability. If the model starts to nose down, it also moves forward which makes it then pitch up and that stops the forward motion.

If damping is insufficient, and the phase relation is right, this apparent static stability can turn into an unstable oscillation. Apparently the damping in pitch and forward motion were not strong enough to keep the model from becoming unstable.

Even though this behavior was unacceptable compared to other flying models, the pilot could control the craft in pitch. Here, as in the hovering condition, the control of a full-scale airplane would be easier because the angular velocities would be smaller and because the pilot could sense motions sooner and apply corrective control more rapidly.

NACA says these flight conditions might be considered acceptable in an emergency condition, such as failure of the autopilot.

Use of the pitch damper changed the picture remarkably. The unstable oscillation changed to complete stability, and the model would fly indefinitely without manual control from the pilot.

Yaw control was weak, according to the pilot, and particularly noticeable when the model was disturbed by air turbulence. Rolling the model caused some yaw, which troubled the yaw pilot because he couldn't counteract it efficiently.

Roll was controllable in spite of the tendency for the roll to diverge. The roll pilot was as troubled by effects of yaw as was the yaw pilot by the effects of roll.

Hovering Near the Ground

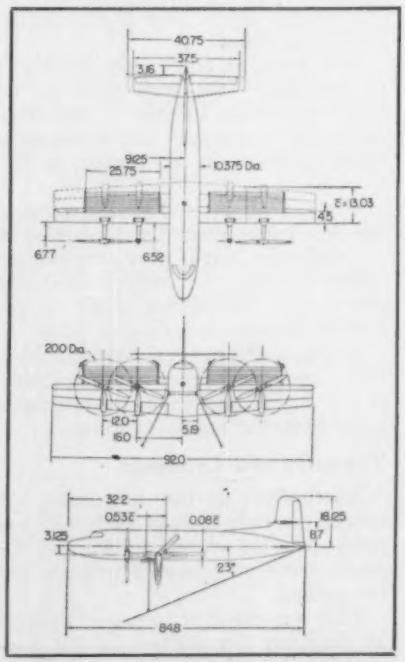
The pilots had to fly the model every second while it was hovering near the ground, because even a small disturbance would make the model lose enough height to touch the ground. All flights were made with the pitch damper.

There was no noticeable ground effect on control effectiveness, although the model did tend to move forward as it neared the ground. This was cured by applying up-elevator trim as the model decreased altitude.

Generally, the stability and control of the model were as good near the ground as they were well above it, according to the NACA.

Developments

Hovering flights pitched the fuselage at about a 15-deg. angle when the lower auxiliary vanes were attached, and at about 20 deg. when they were



THREE-VIEW: Dimensions in inches.

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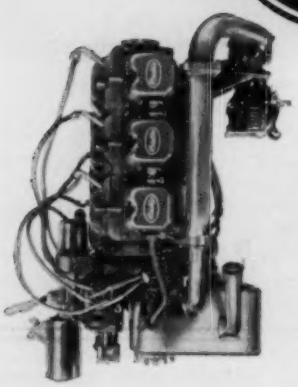
the BELL 47G

...and still powered by Franklin



4 out of 5 helicopters under 400 h.p. produced this year will have power by Franklin

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*28E17-1	30	5	13	8.25	6000	69	AND10266 XVI-A
*28E14-1	40	5	14.5	9.25	6000	83	AND10266 XVI-A
*28E15-1	60	6	16	9.25	6000	100	AND10266 XVI-A
28E19-1	10	6	8.4	6.5	8000	31	AND10262 XII-A
28E19-3	10	6	8.4	6.5	8000	32	New 9" Flange
28E20-1	20	6	8.5	6.5	8000	45	AND10262 XII-A
28E20-3	20	6	8.5	6.5	8000	46	New 9" Flange
28E21-1	30	10	12.4	6.5	8000	60	AND10262 XII-A
28E21-3	30	10	12.4	6.5	8000	61	New 9" Flange
**28E10-1	9	6	8.6	6.5	8000	39.5	AND10262 XII-A

*These generators include integral fan permitting full load continuously up to 80°C at sea level with no additional cooling.

**This generator incorporates a DC output of 30 volts, 50 amps capacity in addition to the AC output.

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discarded. No attempt was made to reduce the angle of pitch on the fuselage, although tests indicate that the lower vanes could do the trick.

Tests with the first cascade wing vehicle showed that the craft would hover at zero degree fuselage pitch. But for this, both upper and lower vanes were necessary, and they had to be curved airfoil shapes instead of curved flat plates. Such a system would be much more difficult to retract.

Positive wing incidence might be another way to reduce the pitch angle of the fuselage.

Meantime, scientists at the 7x10-ft. Tunnel Branch are working on another approach, using modified plain and slotted flaps to turn the slipstream through 90 deg. for vertical lift. With slotted flaps and a single auxiliary vane mounted above the wing, this group has calculated that vertical takeoff could be attained with an initial fuselage attitude of 16 deg. and at airplane weights up to 90% of the total thrust.

First NACA report on these tests is Technical Note 3440, written by Louis P. Tosti and Edwin E. Davenport of the Langley free-flight tunnel section. NACA has prepared a supplementary motion picture of the tests which is available on loan from NACA headquarters in Washington.

Highspeed Thermal Effects Outlined

Background to an understanding of the thermal effects of highspeed flight is presented in a survey booklet available from New York University.

The survey was prepared by Dr. George Gerard, assistant director, Research Division, NYU College of Engineering, and George T. Hayes of Stanford Research Institute. It includes summaries of nine papers presented last December at a symposium of the American Society of Mechanical Engineers (AW Dec. 13, 1954, p. 15).

Topics include effects of supersonic flight on fuel, cooling and other systems, on airframes and other structures, missiles, aircraft design and human factors in highspeed, high-altitude flight.

Copies of the survey may be obtained from the Office of Information Services, New York University, University Heights, New York 53, N. Y.

GE Summarizes Bumper Project

Technical highlights of General Electric's Bumper Project, a two-stage rocket development of the proven WAC Corporal and the ex-German V-2, have been summarized in a new company bulletin.

Bumper scored three notable hits

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• **Altitude and speed records** were set by Bumper 5, which touched 244 miles and a top speed of 5,150 mph.

• **Highest sustained speed reached** in the atmosphere was during Bumper 7 flight; performance is still classified.

Early details of Bumper were told in AVIATION WEEK, Mar. 8, 1954, p. 26; now General Electric's summary bulletin describes the entire program. Designated GE-R55AO515, the bulletin may be obtained from the company, at 2900 Campbell Ave., Schenectady 6, N. Y.

NBS Develops Tests For Balloon Fabric

How can expendable sounding balloons be tested?

Inflation at room temperatures doesn't reflect high-altitude problems, brittleness tests made on samples of the fabric are inadequate, and conventional tensile tests are variable and don't simulate flight conditions.

So National Bureau of Standards scientists thought of a two-way stretch and found the answer.

Now a circular sample of the balloon fabric is clamped around its rim and inflated in a cold box. Statistical data from these tests are used to develop two quantities: effective elongation and minimum bursting pressure.

These define the properties of the fabric batch and therefore of the balloons.

Grumman Installs IBM Data Processor

Installation of an electronic data processing machine at Grumman Aircraft Engineering Corp.'s Bethpage, L. I., plant is believed to be the first in the New York area.

The new machine is to be applied in solving design and test equations in acrodynamics, structures and flight testing.

Grumman's installation is one of 500 scheduled for industry by the manufacturer, International Business Machines Corp., during the next two years.

Grumman's unit is the IBM 650 Magnetic Drum Data Processing Machine. It can remember up to 20,000 digits, add or subtract 10-digit numbers at the rate of 200 a second, multiply 10-digit numbers at the rate of 60 a second, and divide 19-digit numbers by 10-digit numbers at about 50 a second.

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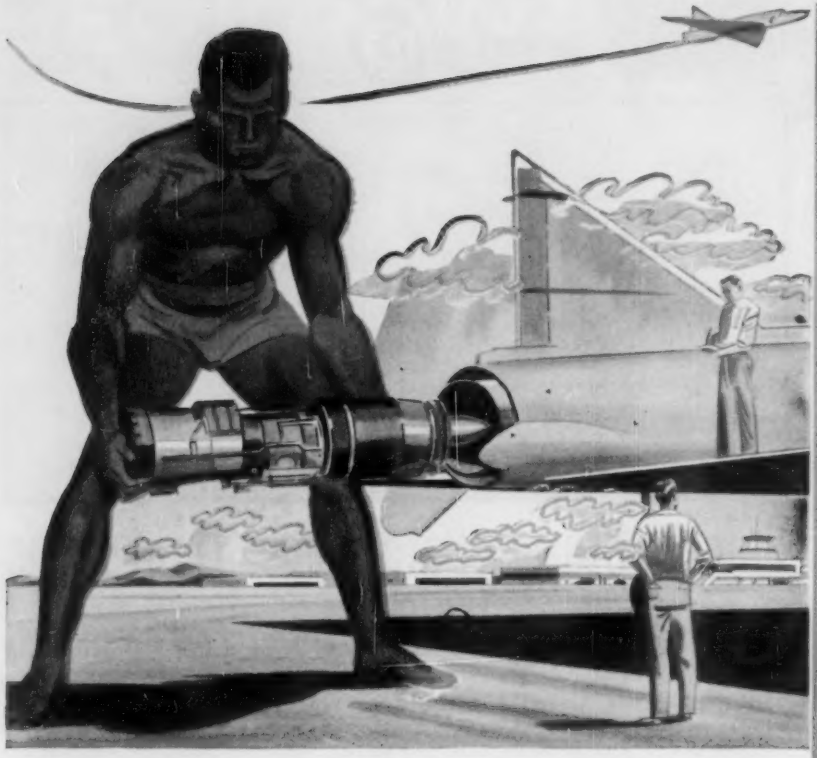

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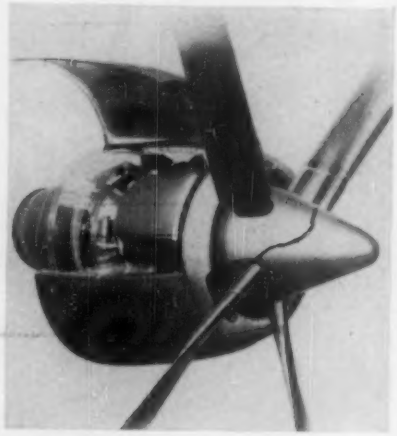
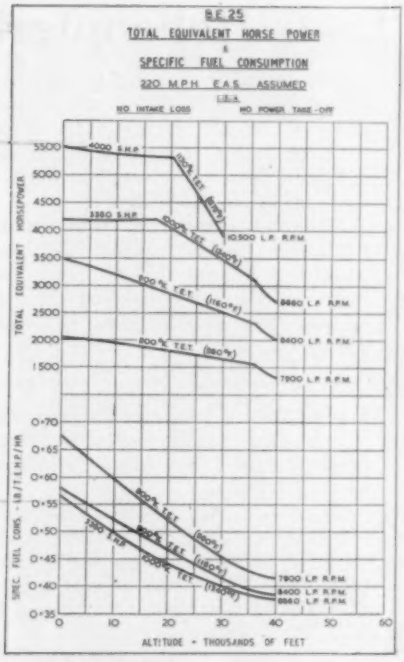
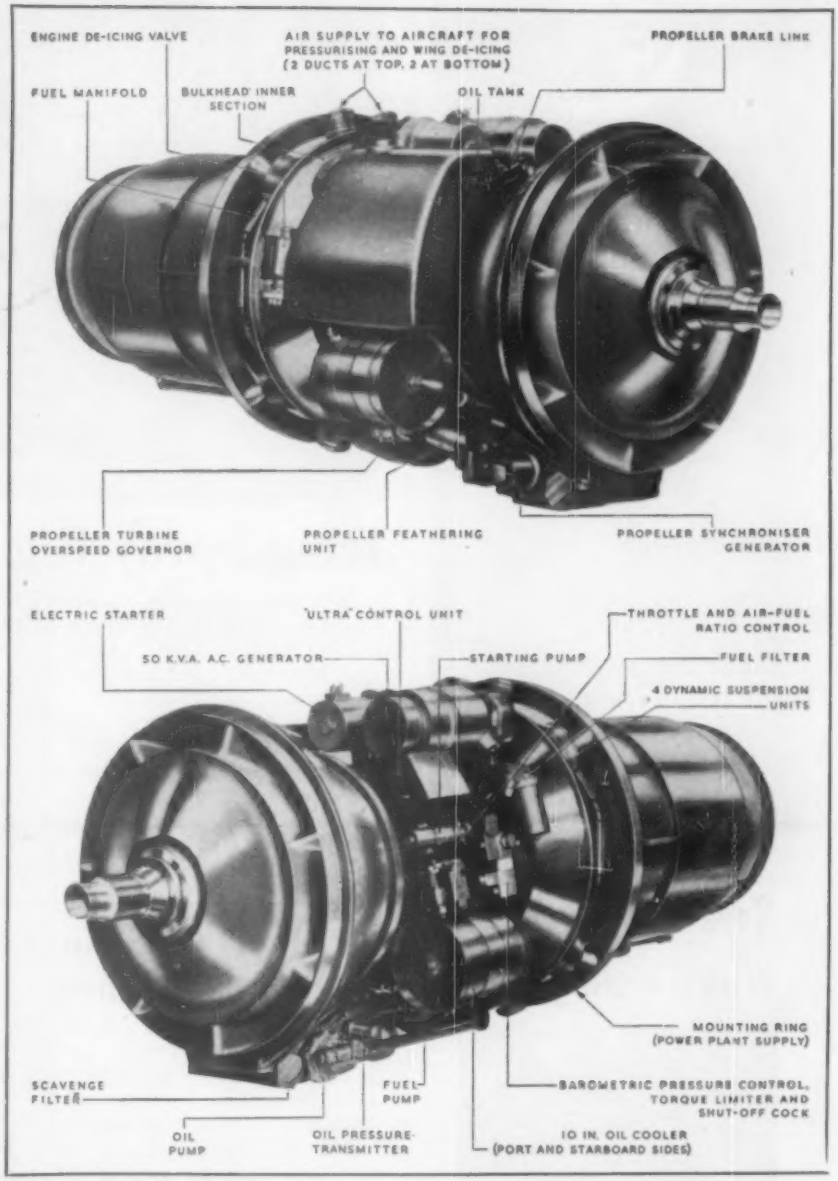


PACKAGE



PERFORMANCE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POWERPLANT MOCKUP

B.E. 25: Constant Power to 20,000 Ft.

First official performance details of the Bristol B.E. 25 twin-spool turboprop point up the constant-power feature of this unique engine.

Basically the engine has a sea-level potential of about 8,000 hp., but by torque-limiting the engine, this figure is kept at a constant 4,000 hp. from sea level to 20,000 ft. At the higher cruise altitudes on the order of 30,000 ft., available cruise power from the engine is approximately 3,500 hp.

This cruise power rating at altitude was one of four considerations governing the design of the B.E. 25. The others were:

• **Specific fuel consumption should be equal to the best compound piston engine.**

• **Takeoff power should be independent of altitude** and air temperature at any airport in the world.

• **Design exploitation of the turboprop formula:** The ability to produce large power for small bulk and weight.

The B.E. 25 is a two-spool layout, and is referred to as a supercharged turboprop by Bristol.

These Bristol figures confirm earlier data published here (AW Dec. 14, 1953, p. 32; Oct. 25, 1954, p. 13).

Bristol plans to produce the engine as a complete powerplant package, with accessories, cowling and the de Havilland 16-ft.-diameter four-blade propeller now used on Bristol's Proteus 755 turboprop.

Under cruise conditions, prop tip speed will be about 700 ft./sec., which is expected to make for a very low noise level.

Pressure ratio of the B.E. 25 twin-spool compressor is 10:1. Engine is approximately 9 ft. long, 41 in. in diameter and weighs 3,200 lb. dry.

Reduction gearing will be the same used on the Proteus, a two-stage epicyclic system.

It is possible to use this gear, says Bristol, because of the torque-limited power at any altitude.

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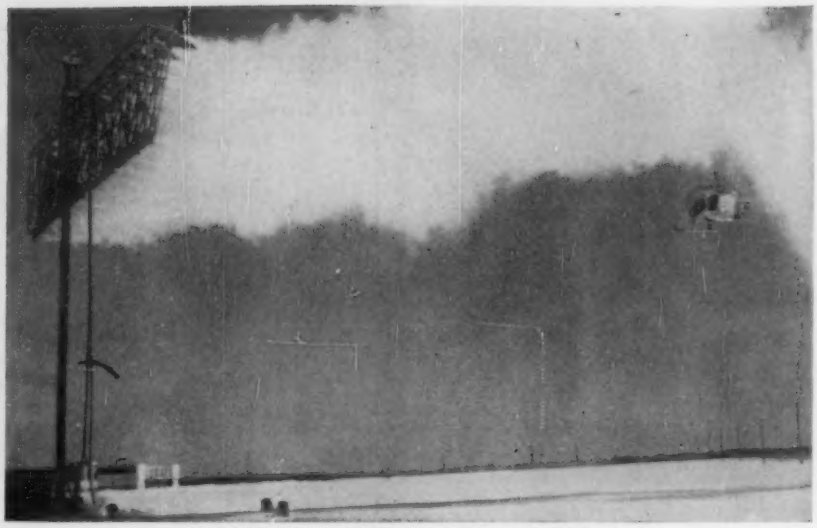


Icing Spray Rig Tests Helicopters

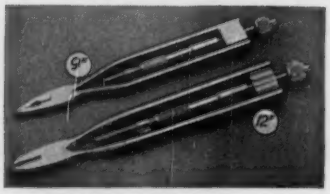
Helicopter performance under icing conditions is being studied in a unique outdoor spray rig by Canadian scientists of the National Acronautical Establishment.

Twenty test flights were made with a Royal Canadian Navy Bell HTL-4 copter. The craft flew in a simulated icing cloud produced by a gigantic spray rig, and in natural supercooled fogs and light freezing rains.

Unfavorable weather and maintenance problems delayed development of apparatus to measure icing conditions and shapes of the ice formations on rotor blades, but much useful data has been determined on the effects of icing on helicopter blades.

The unusual spray rig, requiring careful design because of the high wind loads on a top-heavy structure, was developed and constructed by the Ottawa branch of the Dominion Bridge Co., Ltd.

Save ⅔ of your Wire Twisting Costs



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reduce safety wiring labor costs as much as $140 per engine. Split second twirling action wires 3 engines in time required for one by any other method.

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Unconditional guarantee! Write for details including specifications, testimonials and list of users. RALPH C. ROBINSON CO., Box 494C, North Sacramento 15, Calif.

RPI-UAC Co-Sponsor Engineering School

Graduate engineering education will be brought to the Hartford, Conn., area in a unique plan co-sponsored by Rensselaer Polytechnic Institute and United Aircraft Corp.

The program is not an on-the-job training course, but a completely separate graduate-school branch of RPI, to be located in Pratt & Whitney's Foxmart facility, now being used for nuclear powerplant development by the engine division.

RPI faculty will staff the new school, aided by qualified scientists and engineers from United Aircraft. Programs will be strong in aeronautical and mechanical engineering, and applied mechanics.

First year's enrollment of 200 is expected to be composed heavily of P&WA engineers, with entries to be admitted late from Hamilton Standard Division and the company's research department. Ultimately any Hartford area resident will be able to attend for a master's or doctor's degree.

H. M. Horner, president of UAC, said "if the working engineer in Hartford goes away to graduate school, we lose him for at least one to three years. We decided that it was best to bring a graduate center here to meet this continuing problem."

Rensselaer, the oldest engineering school in the country, probably will establish a board of advisors for the graduate center. The board will be a group of Hartford men, and work under the RPI board of trustees.

NYU to Offer Nuclear Degree

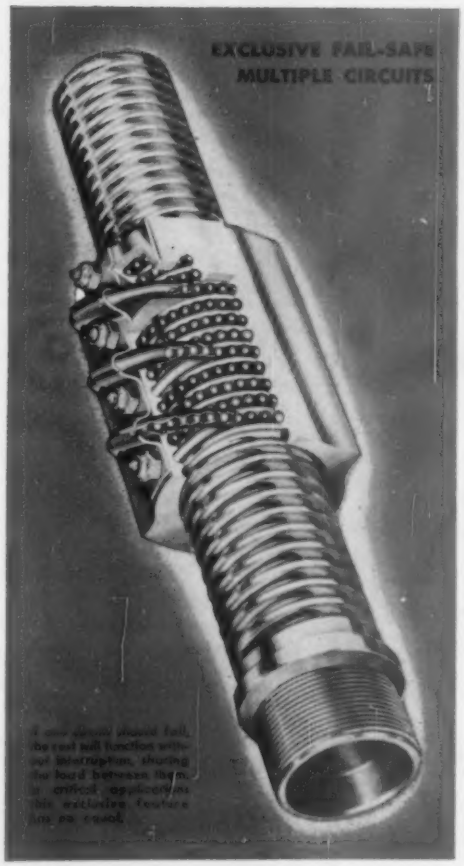
Master of nuclear engineering degree will be conferred on graduate students who complete New York University's College of Engineering course in nuclear engineering.

One of the first such courses in the country, NYU's graduate program will begin this fall. A sub-critical nuclear reactor is planned for the laboratory use of students, if the project is approved by the Atomic Energy Commission. AEC and NYU officials have already discussed this phase of the project, and construction could begin on the reactor this summer.

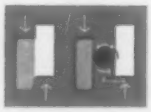
Nuclear engineering is one of the specialized courses to be available to students after completion of a basic

HERE'S A BETTER ACTUATION METHOD!

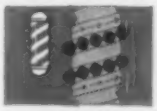
Saginaw ball/bearing Screws can help you solve weight, power and temperature problems



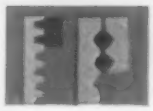
WHAT IT IS AND HOW IT WORKS



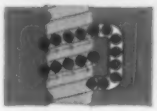
Let's start at the beginning, with the familiar principle that there's far less friction in *rolling* than in *sliding*. By applying this principle,



Like stripes on a barber pole, the balls travel toward end of nut through spiral "tunnel" formed by concave threads in both screw and mating nut.



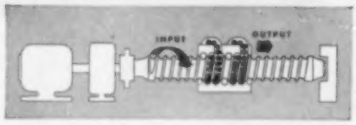
the *Safety ball/bearing Screw* radically increases the efficiency of rotary-to-linear motion (and vice versa). Instead of *sliding*, mating surfaces *glide* on rolling steel balls.



At end of trip, one or more tubular guides lead balls diagonally back across outside of nut to starting point, forming closed circuit through which balls recirculate.

TREMENDOUS ADVANTAGES IN AIRCRAFT ACTUATION

Conventional Acme screw's efficiency is less than 25%; *Safety ball/bearing Screw's* ranges from 90 to 95%! Combined with electric, hydraulic or pneumatic power source, it forms an actuator for aircraft (and similar uses) that:



SAVES WEIGHT—permits use of smaller motors and gear boxes; eliminates pumps, accumulators, piping, etc.

SAVES POWER—Safety b/b Screw requires only 1/3 as much torque for same lineal output as conventional Acme screw.

SOLVES TEMPERATURE PROBLEMS—operates successfully from −75°F to +900°F —and *without lubrication*, if needed.

ASSURES POSITIVE POSITIONING—permits precision control within thousandths of an inch, plus perfect synchronisation.

INCREASES DEPENDABILITY—offers longer life and added security of *exclusive multiple circuits*, plus greatly decreased dirt sensitivity of special "Gothic arch"-shaped races.

REDUCES PART AND INSTALLATION COSTS—savings in weight, motor size, power and auxiliary equipment cut cost, too.

ANY SIZE FROM 1½ INCHES TO 39½ FEET IN LENGTH

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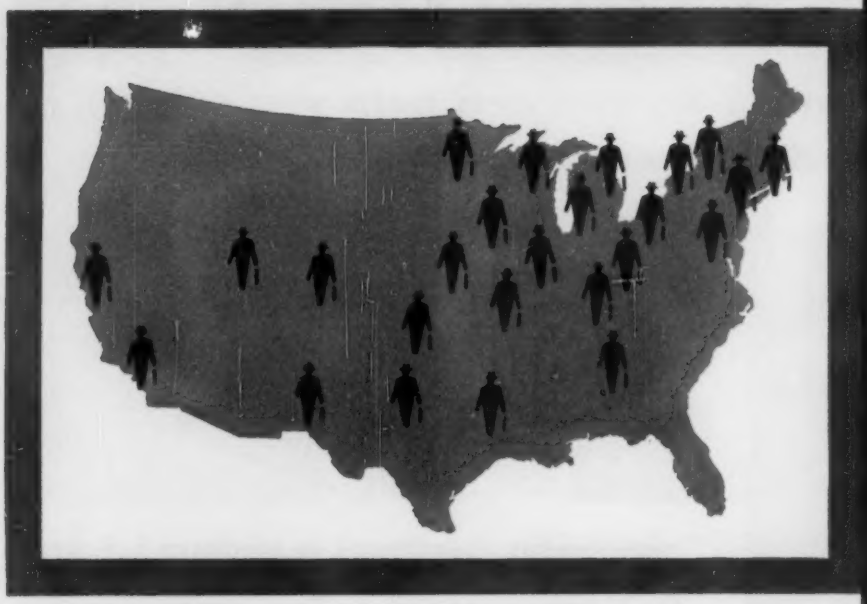

If you need help of any kind in the rotary airborne equipment field, you can have a highly skilled Leland engineer at your side in hours, or sometimes, even minutes.

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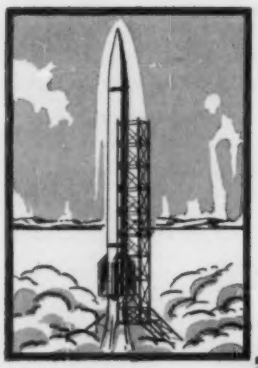

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course in engineering science, also starting this fall. The engineering science course is aimed at students who want to continue in research and development, and is a basic four-year program directed primarily toward specialization in nuclear engineering. Heavy concentrations of mathematics, physics and chemistry feature the engineering science course.

Cornell Wind Tunnel Passes Busy Month

The huge wind tunnel of Cornell Aeronautical Laboratory has set a new testing record of 417¾ hours during the month of May. No other known wind tunnel has ever done as much testing, a laboratory spokesman said.

The month's mark put the laboratory within 313 hours of setting a 4,000-hour record for the fiscal year ending June 30.

Over and above the time logged by the Air Force and aircraft manufacturers, the laboratory did 20½ hours of its own research on the Bell X-1 model and calibration and technique development.

The highest previous record was 416¾ hours, set last October.

Research during May was performed on 10 different programs, including dynamic stability research for the U. S. Air Force and high subsonic and transonic flutter studies. Companies that had models in the tunnel for testing were North American, Lockheed, Doug-

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The pure iron crystals are grown by a technique originated by Dr. John C. Kelly, physical chemist in Westinghouse's lab. Current work is done by Drs. A. W. Cochardt, H. W. Wiedersich and R. L. Eisner of the metallurgy department.

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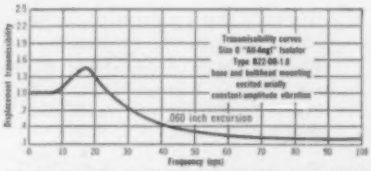

Typical transmissibility curve for ALL-ANGL mount, both base and bulkhead mounting, excited axially at constant amplitude.

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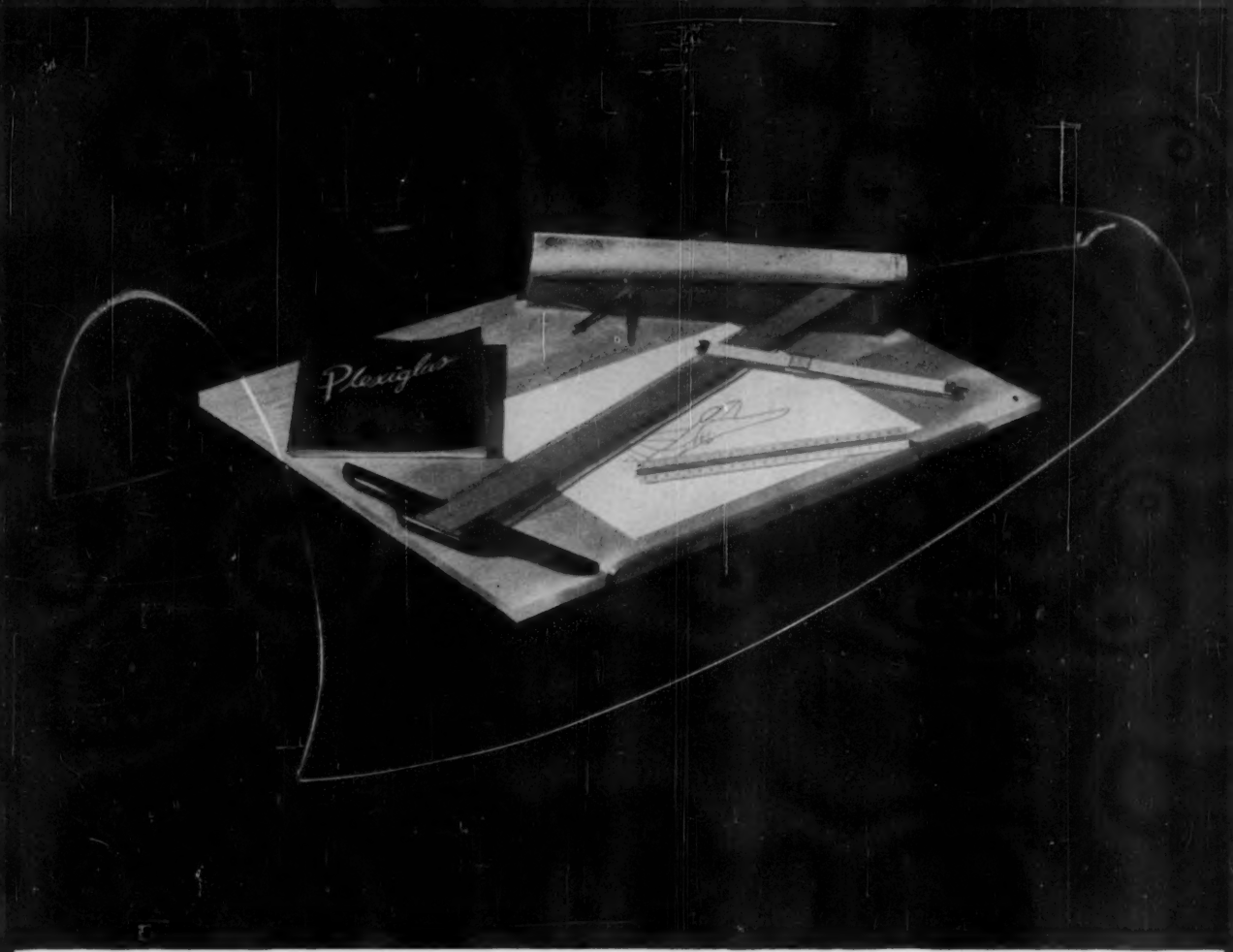

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● The combination of properties in PLEXIGLAS acrylic plastic—clarity, strength, formability, resistance to weather—have made it a by-word for canopies, noses, astrodomes and other transparent enclosures on all types of aircraft.

Of equal importance with these properties is the design skill of aircraft engineers who determine the shapes to be formed, and the type and thickness of PLEXIGLAS to be used. They must relate stress-distribution, attachment techniques, and maximum service requirements to the known capabilities of PLEXIGLAS and to the over-all design of a plane.

The proper design of enclosures demands full knowledge of PLEXIGLAS. Over the years, Rohm & Haas Company, in addition to manufacturing an aircraft glazing material with the optimum balance of properties, has worked closely with the aircraft industry and the armed services so that plane designers will have a thorough understanding of acrylic plastic and will be able to use the material to best advantage.

The Rohm & Haas Company manual, "Handbook for Aircraft Engineers", provides detailed physical data on PLEXIGLAS and outlines recommended practices in the design of transparent aircraft parts. Engineers are invited to write for a copy.

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las, Grumman, Chance Vought and Avro-Canada.

The Cornell wind tunnel is the variable density type with an 8½-ft. test section. By inserting a 4-ft. throat section, it is possible to test at transonic speeds (up to 1,000 mph.).

Turn, Dive and Bank Shown on One Face

Three-in-one blind-flight instrument gives pictorial presentation of whether the plane is diving or climbing and at what angle, whether it is banking to the right or left and at what angle, and the heading on an azimuth scale.

The manufacturer says the equipment represents the initial step in a new trend in flight instrumentation, which the firm calls the Nafli (natural flight instrument) system. This unit combines the three presentations on a 3-in. face, with indicators contained in a standard 3½-in. case. Synchros in the instrument receive signals derived from the directional and vertical gyros installed in a remotely located amplifier chassis.

Directional gyro can either be slaved to the earth's magnetic field or operated as a free gyro. In the latter case it permits navigation in Polar regions, the maker says.

The precision gyros are intended to serve as the basis for an autopilot, which may be installed at a later date. Synchro connections are available for this purpose.

Nafli is designed to meet MIL environmental specs. Transistor amplifiers are used. Complete system weighs 27 lb.

Lear, Inc., LearCal Division, Santa Monica, Calif.

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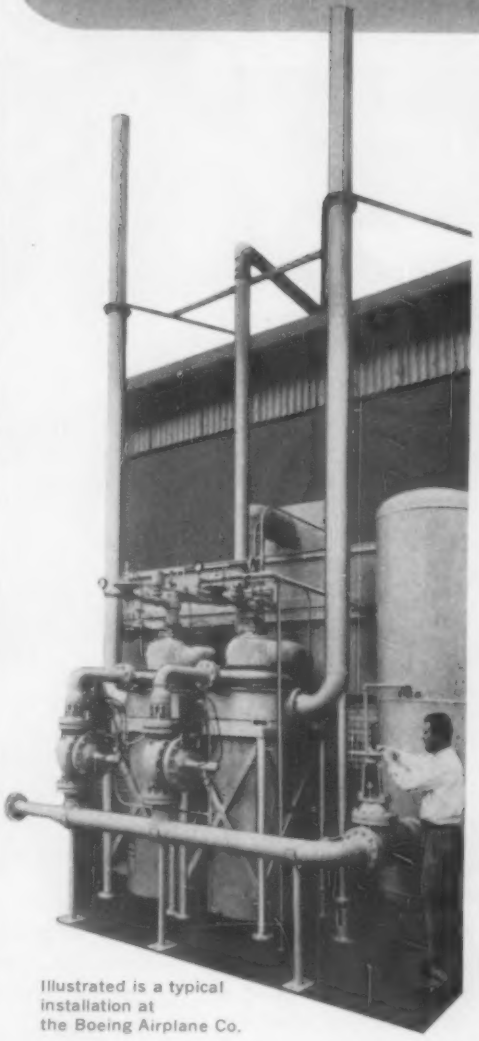

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WHAT'S NEW

Telling the Market

Aluminum flux guide includes comparison of fluxed and unfluxed aluminum alloys, Apex Smelting Co., 2537 W. Taylor St., Chicago 12, Ill. . . . **Mounting bases, vibration and shock controls** to JAN and MIL specs, Catalog AB-35, T. R. Finn & Co., Inc., Electronics Division, 200 Central Ave., Hawthorne, N. J. . . . **Specialized fabrication facilities** for airframe, jet engine, radar reflectors and comparable components, Lavelle Aircraft Corp., Newton, Bucks County, Pa.

Five oxyacetylene torch sets with aluminum handles, Marquette Manufacturing Co., 307 E. Hennepin Ave., Minneapolis, Minn. . . . Thermostat engineering data brochure covers **Temp-Guard thermostats and motor protectors,** Franklin Dales Co., 180-184 E. Mill St., Akron 8, Ohio. . . . **Punch and die** catalog, Whitney Metal Tool Co., 702 Forbes St., Rockford, Ill.

Ellis casting process for complex investment cast parts including microwave fittings, Howard Foundry Co., 1700 N. Kostner Ave., Chicago 39, Ill. . . . Catalogs 2 lists **standardized process control instruments,** Fischer & Porter Co., 397 Jacksonville Rd., Hatboro, Pa. . . . **Gas-Fired Furnaces for Investment Castings,** Bulletin SC-170, Surface Combustion Corp., Advertising Dept., Toledo 1, Ohio.

Protective qualities of **cocoon strippable plastic** in areas where radioactive materials are used, R. M. Hollingshead Corp., Industrial Sales Division, Camden 2, N. J. . . . **Self-locking threads** for bolts, screws, studs and turnbuckles, Starloc, Inc., 235 Canal St., New York 13, N. Y. . . . **Servofax glass** for transmitting infra-red radiation in 2-12.5 micron wavelength band, Servo Corp. of America, 2020 Jericho Turnpike, New Hyde Park, N. Y.

Neoflow continuous-flow reducing camera for making smaller-size photocopies, Peerless Photo Products, Inc., Shoreham, L. I., N. Y. . . . **Mathagraph drafting instrument** is stated to create isometric, dimetric and trimetric drawings from flat views, Wilkinson Co., Box 638, Arnold, Md. . . . Guide to use of **Murex Croloy chrome-moly electrodes** for welding equipment subject to high-temperature, high-pressure service, Metal & Thermit Corp., New York, N. Y.

Composition, specs, applications and

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advantages of **Quad-ring hydraulic seals,** folder and samples, Minnesota Rubber & Gasket Co., Dept. KP, 3630 Wooddale Ave., Minneapolis 16, Minn. . . . **Socket screw product** data sheets, Bristol Co., Socket Screw Division, Waterbury 20, Conn. Firm also issues bulletin outlining methods and controls used in making recording instrument charts.

Simplified Drafting, 36-page booklet, outlines method said to save 40-50% on the number of hours needed for a given work volume, J. H. Bergen, American Machine & Foundry Co., General Engineering Laboratory, 11 Bruce Place, Greenwich, Conn. . . . **List of over 100 welding and cutting technical reprints,** texts, safety booklets, slide-films and movies, Air Reduction Sales Co., 60 E. 42d St., N. Y. . . . **Pyrometer supplies catalog and buyers guide,** Arklay S. Richards Co., Inc., Newton Highlands 61, Mass.

Rzeppa OV miniature constant-velocity universal joint technical data, Gear Grinding Co., Joint Division, 3901 Christopher, Detroit 11, Mich. . . . Leak-proof metering valve for gases or liquids, Robbins Aviation, 1735 W. Florence Ave., Los Angeles 47, Calif. . . . **Layout Tapes for Industrial Planning** in transparent and opaque forms, Labelon Tape Co., Inc., 450 Atlantic Ave., Rochester 9, N. Y. . . . High-performance **magnetic amplifiers and frequency multipliers,** American Research & Manufacturing Corp., 4914 Del Ray Ave., Bethesda 14, Md.

Silicone rubber insulated high-temperature wire and cables, Publication 19-594, General Electric Co., Wire & Cable Dept., Bridgeport 2, Conn. . . . **Two-piece spherical bearing rod ends,** bore sizes ranging from ⅛ in. through 1¼ in. in male and female types, Catalog 455, A. W. Conrath, sales manager, Spherical Bearing Corp., 405 Woodend Rd., Stratford, Conn.

Duodial series RB turns-counting dial for mounting on ¼-in. shafts, Data Sheet 54-76, Helipot Technical Information Service, Helipot Corp., Meridian, S. Pasadena, Calif. . . . Complete line **of die springs and simplified selection tables,** Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. . . . Red Ring Model GCR-12-in. **internal rotary gear shaving machine,** Bulletin S55-4, National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. . . . **Fine pitch hobs,** including American Standard 20-deg. involute fine-pitch system, Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. . . . **Automatic lubrication systems for machine tools,** Bulletin 5410, Trabon Engineering Corp., 1814 E. 40th St., Cleveland 3, Ohio.

Publications Received

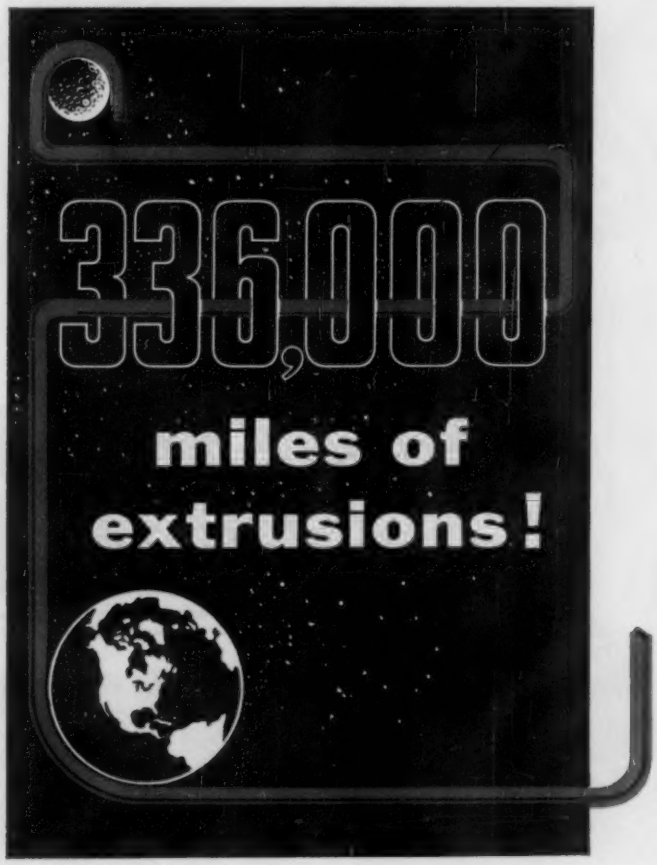
• **Airport Shop Operations**—by Leslie A. Bryan—Pub. by University of Illinois, Institute of Aviation, Urbana, Ill. Free of charge, upon request; 51 pp. Basic information necessary to organize and operate an aircraft repair and maintenance unit.

• **Defense Materials System**—pub. by Business and Defense Services Administration, Department of Commerce—Available from Government Printing Office, Washington 25, D. C., or Department of Commerce Field Offices. 25¢; 41 pp. Handbook explains, in question and answer form, the phases of the Defense Materials System under which contractors are required to operate in procurement of contracts.

• **U. S. Military Doctrine**—Dale O. Smith, Brig. Gen., USAF—pub. by Little, Brown & Co., 34 Beason St., Boston 6, Mass. $3.50; 256 pp. The author examines current military policy of the United States.

• **The Lonely Sky**—by William Bridgeman with Jacqueline Hazard—Pub. by Henry Holt and Co., 383 Madison Ave., New York 17, N. Y. $3.95; 316 pp. Story of one of America's top test pilots.

• **The Dam Busters**—by Paul Brickhill—Pub. by Ballantine Books, Inc., 404 Fifth Ave., New York 18, N. Y. Hardbound edition, $2.00; paperbound, 35¢: 185 pp. Story of the development and activities of RAF Squadron 617.



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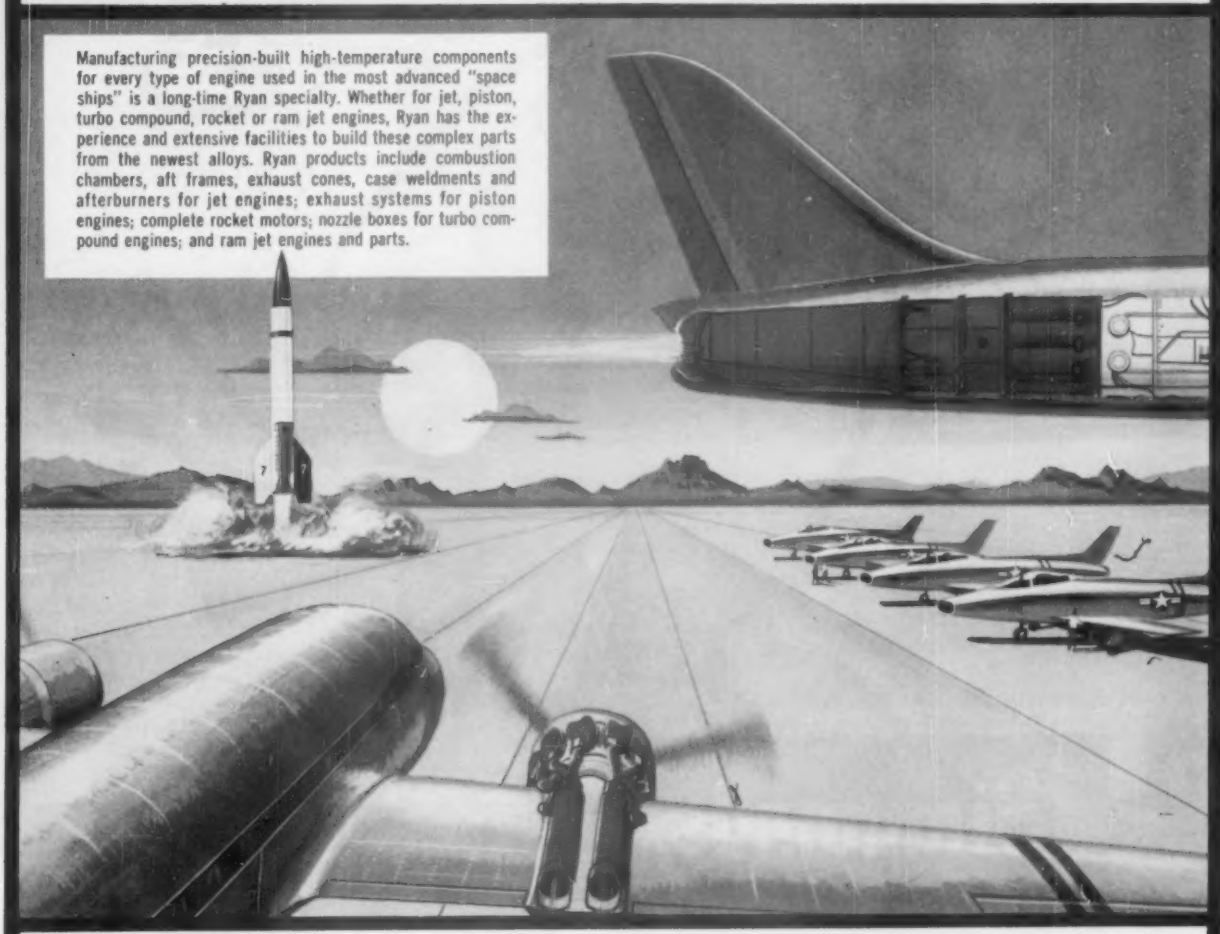

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F-102 Fits Into Cook-Craigie Pattern

By Irving Stone

San Diego—The F-102 delta-wing supersonic interceptor typifies a new approach in initial planning for production.

This plane, the first programmed under the Cook-Craigie plan was given special design and production engineering consideration by Convair-San Diego Division of General Dynamics Corp.

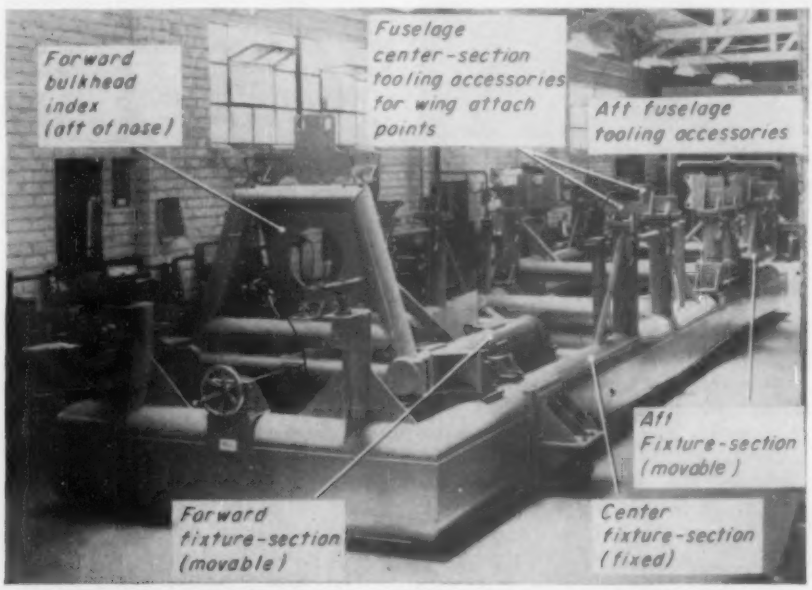
Producibility was not limited to manufacturing rates initially contemplated. Instead, aim was to provide a design, manufacturing and tooling scheme which would permit a greatly accelerated production rate, should it be required quickly.

Key feature in this approach is that production thinking takes on top importance along with engineering, from the very beginning of the project.

Initial studies which established the pattern of manufacture for the F-102 were extensive. All elements, such as floor space, sequence, lead time, engineering and production controls, machine tool and material needs and numerous other factors were brought in for close scrutiny. Each segment of manufacture was outlined in detail, prior to the start of the tool planning program.

In essence, the airframe was built on paper for combined evaluation by engineering, manufacturing, and tooling teams. This close liaison worked toward achievement of the most feasible manufacturing plan to meet engineering requirements and permit the airframe to be held within the close dimensional tolerances established.

Under previous procurement, Convair engineers point out, the concept was to build two experimental aircraft, then phase into the production program, in most cases with an engineer-


Forward bulkhead index (aft of nose)
Fuselage center-section tooling accessories for wing attach points
Aft fuselage tooling accessories
Aft Fixture-section (movable)
Forward fixture-section (movable)
Center fixture-section (fixed)

F-102 FUSELAGE MATING FIXTURE was built by Hardman Tool & Engineering Co.

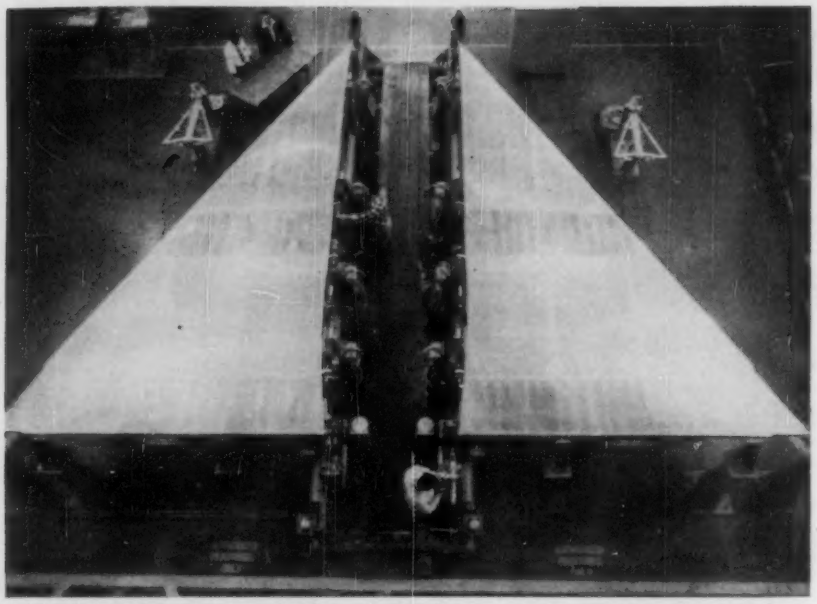
Cook-Craigie Plan

To avoid the logjam that occurs when large quantities of new military aircraft must undergo extensive "debugging" before they are combat-ready, USAF last year adopted the Cook-Craigie procurement plan (AW Apr. 12, 1954, p. 13).

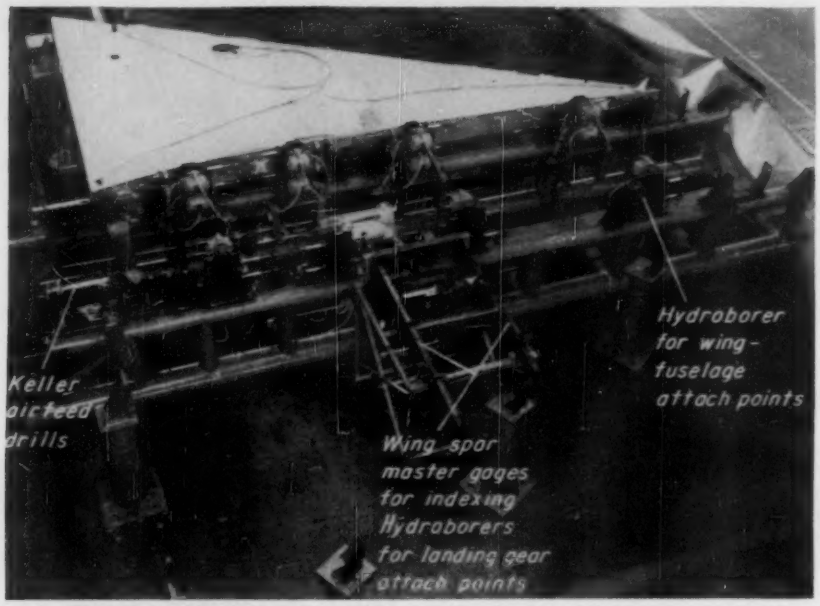
Known formally as the Initial Low Rate of Aircraft Production Plan, it provides for holding output to a relatively low level for 18-24 months while the delivered aircraft are "wrung out" in an extensive test program. During this period, major airframe, engine and component problems are worked out and necessary modifications cranked into the plane's production pattern.

This plan eliminates experimental tooling, prototypes and drawings. First aircraft are built with production-type tooling and from production drawings.

The plan gets its informal name from Gens. Laurence Craigie and Orval Cook, who, together with Gen. Donald Putt, are given principal credit for putting it into operation.



F-102 COMPLETE WING in Hardman boring fixture. Tool incorporates 20 Hydroborer units and 12 Keller airfeed drills. Note landing gear on sides of wing panels.


Keller airfeed drills
Hydroborer for wing-fuselage attach points
Wing spar master gages for indexing Hydroborers for landing gear attach points

ALL WING TO FUSELAGE attach points are bored, and landing gear attach points are bored and faced in this fixture. Picture shows left-hand panel in place.

ing design which was not broken down for most efficient manufacture.

In many cases, result was a need for considerable redesign, new factory floor layout and retooling as the program went into production.

Because tooling for the F-102 was formulated to support an anticipated accelerated rate of production (although buildup to this high rate might come gradually), higher tooling expense was necessarily involved. But this would be far outweighed, should the accelerated rate be put into effect, by the cost and time normally involved in substantial redesign of the structure for mass production.

Even at an early stage of an accelerated buildup, the permanent-type high-production tooling permits the plane to be built with less direct manufacturing man-hours, leading to a cheaper airplane sooner, Convair engineers say.

Also, this type of permanent tooling allows interchangeability of structural components and other items to be achieved virtually from the start of the program. This is a production aid to simplify assembly, also eases the job of servicing the plane in the field.

Density of the F-102 structure, dictated by design performance, precluded the conventional approach of generally building the airframe, then installing primary equipment and furnishings.

Accordingly, the airframe was broken down into subassemblies of such sizes as to provide maximum accessibility for work within the units and for installation of as many primary items (equipment, bracketry, wiring, etc.) as feasible.

Configurations of structural components, as well as size of the subassemblies, were chosen to permit the use of automatic joining methods as much as possible.

Another consideration in the size of subassemblies, such as in the wing, was predicated on the sealing of the integral tanks with adhesive bonding. This meant that units had to be limited in size to be accommodated by conventional ovens for curing sealant.

How F-102 Is Built

Building sequence for the F-102 involves an ingenious arrangement.

Cockpit area is manufactured by attaching intake duct segments to the cockpit skin. The skin-duct panel is then attached, within a fixture, to cockpit flooring and front and rear pressure bulkheads. Windshield frame is assembled in this same fixture.

This unit is then placed into a trunnion-type frame, which permits the nose to be turned to the most advantageous position to work, most efficiently, both the cockpit and nose wheel well area.

This trunnion-type fixture controls the dimensional accuracy of the attaching longerons and maintains the external configuration of the intake ducts where they tie into the integral duct structure in the fuselage section aft of the cockpit.

Next series of assemblies, constituting the center fuselage barrel (started ahead of the aft section because of flow time involved), is manufactured in four panel sections (two on each side) with integral ducting as part of the primary structure.

These quarter sections proceed to a common fixture which mates respectively, the two left-hand components and two right-hand components, simultaneously. This is done by moving the afterquarters forward to the mating position with the corresponding forward quarter sections.

This results in two half-barrel sections still affording full working access to interior areas.

After parallel operations on left- and right-hand half sections are completed, the center working platform hinges out of the way and the two half sections are rolled together for mating at the vertical centerline.

This scheme highlights the use of a single fixture, to minimize handling,

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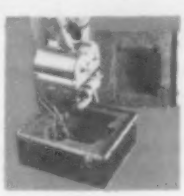

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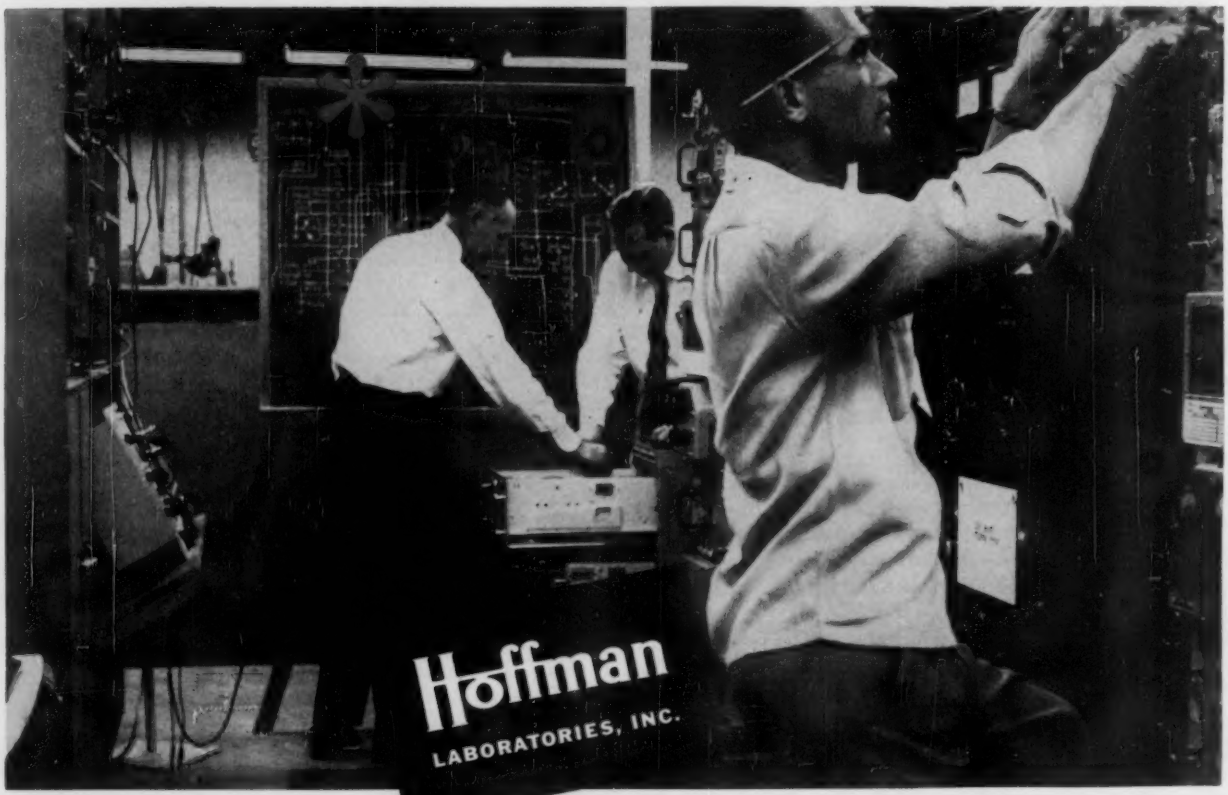

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for bringing the four sections into a single unit.

The after fuselage section now comes into the picture. The vertical fin becomes integral with the after fuselage because it has four main structural members with bottom portions completing the fuselage circumferential members. The latter come to the attaching fixture in clamshell form and are buttoned together and to the fin structure.

The after fuselage-fin structure progresses to the next operation fixture, where the wheel well area subassembly and the section which attaches to the center fuselage are joined by a continuous bottom longeron and enclosing panel section (under the fin forward edge).

After the nose, center and after sections have gone through installation stations for secondary structure, tubing, wiring, etc., overall mating of the fuselage is accomplished by placing these three segments in a single fixture (built by Hardman Tool & Engineering Co.), where the center section is fixed and the nose and aft sections are brought to it for button-up.

Maintaining Control

In addition to maintaining overall contour and alignment, prime consideration is given to the relationship of the fuselage-to-wing attach points, which are located on the center and aft fuselage barrels. Control of these critical points is maintained through a series of operations leading to the mating level, by use of tooling accessories simulating wing fitting attach points.

These tooling accessories, built with a pedestal type base, are attached with full-size pins to the corresponding fuselage members and move with them through the entire fuselage assembly buildup.

Water line, buttock line and station line position of the attach holes is maintained by relating these holes to the fixture pedestals by means of optically aligned facility gages.

Cockpit section is aligned with center section by utilizing the nose landing gear trunnion points and nose cone attach points.

Wing Work

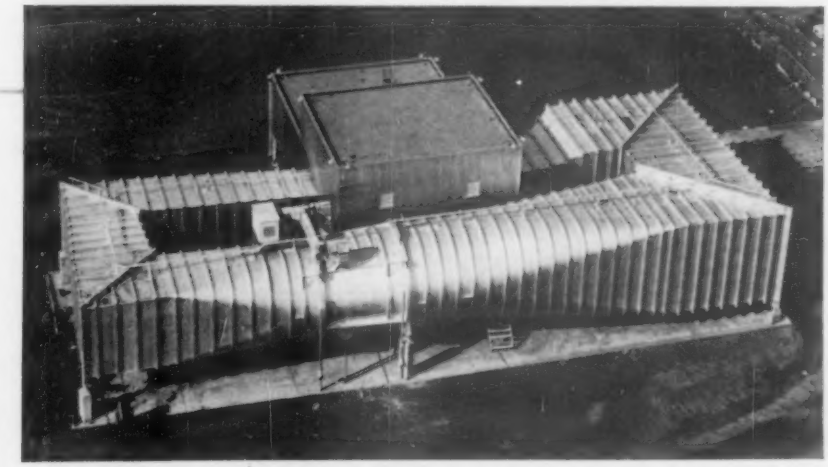
Wing panels are made up of two major subassemblies comprising a forward and an after tank wing section.

After these assemblies have been completed, including application of adhesive sealant for a fuel-tight joint, they are baked at 320F for curing the sealant.

The after wing tank assembly is then joined to the trailing edge assembly which includes the aftermost wing-to-fuselage attach point, on spar 6. (Other wing attach points are on spars 2 and 3 in forward wing section and on spars 4 and 5 in the aft section.)

Forward and after wing sections are then joined in a common fixture, utilizing optically set points which have been progressively maintained.

From this mating operation, the



Million-Dollar Tunnel

Chance Vought's new wind tunnel at its Dallas, Tex., plant, built for a little under one million dollars, was developed for working the lowspeed end of the flight spectrum. With test velocities up to 200 mph., Vought engineers can study behavior of fighters and missiles through the critical lowspeed stability range, as well as at typical approach and maneuvering speeds. Test section is housed in the cubic building; the 1,500-hp. electric motor and driving fan are in the small-diameter portion of the tunnel just outside the building. Pipes along the top spray cooling water during the summer months, and the concrete pad below catches the drip for recirculation. Picture was taken from a Bell helicopter built in a nearby city.

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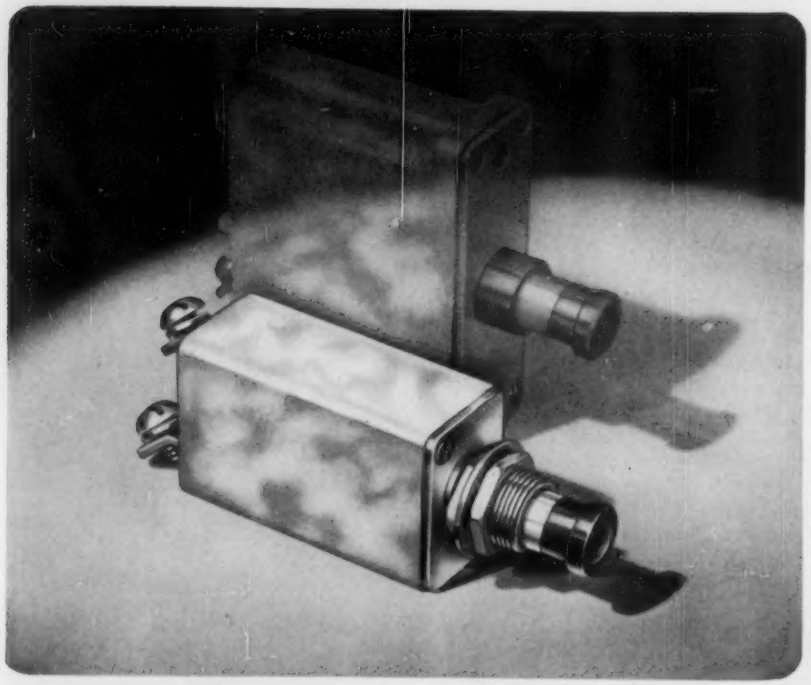
New KLIXON

Miniature Aircraft Circuit Breaker

with Conventional Push-Pull Button Action



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The D6761 is now being tooled for production in ratings from 5 through 35 amperes. Send for advanced technical bulletin.

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wing goes to a semi-automatic bore and ream fixture (also constructed by Hardman) where the attach holes (previously maintained undersized) are brought up to full size. Control of this fixture is established by use of optically aligned facility gages identical to those used on the fuselage.

From the bore and ream operation the wings are transferred to a mechanized primary line, where remaining tubing, electrical and other installations (including main landing gear) are set in.

Next, the wing is placed on a dolly and rolled into position for joining to the fuselage. This dolly incorporates vertical and horizontal positioning to facilitate the connection of the delta wings to the fuselage.

Entire wing-to-fuselage joining, including attachment of main bolts, electrical connections, fuel lines, etc., is targeted for accomplishment in three hours.

Key personnel in the production program include A. P. Higgins, works manager; P. G. Osborn, factory manager; W. P. Woods, chief tool engineer; and V. F. Cernuto, chief of manufacturing control.

Searchlight Furnace

Temperatures above 7,000F are being produced in two solar furnaces converted by Convair engineers from war-surplus antiaircraft searchlights. The two 60-in. furnaces, plus a third searchlight in reserve as a source of heat energy, augment Convair's 120-in. solar furnace that has been testing metals, ceramics, plastics and other structural materials for over a year. Cigarette-sized specimens, held in a special drill chuck, are moved into the focal point for tests. Most materials melt in seconds, and some specimens shatter under thermal shock as they enter the focus. Temperatures of 7,000F compare with 5,800F produced by oxyacetylene cutting torches. An ideal temperature of 8,500F is obtainable under special conditions. Temperature of the sun's surface is 10,000F.

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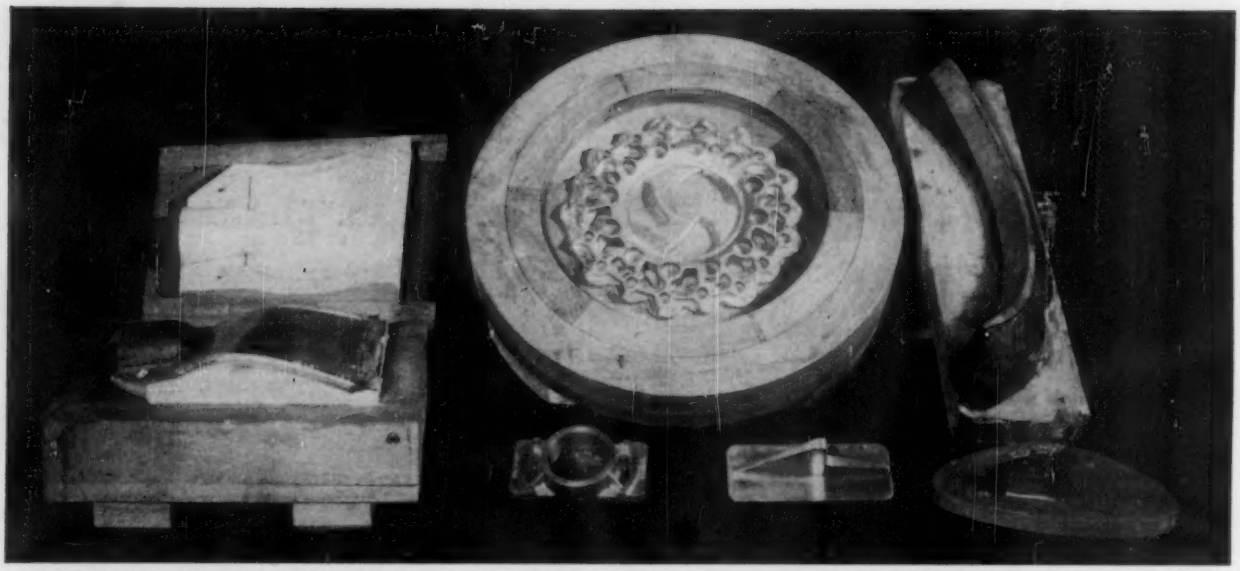
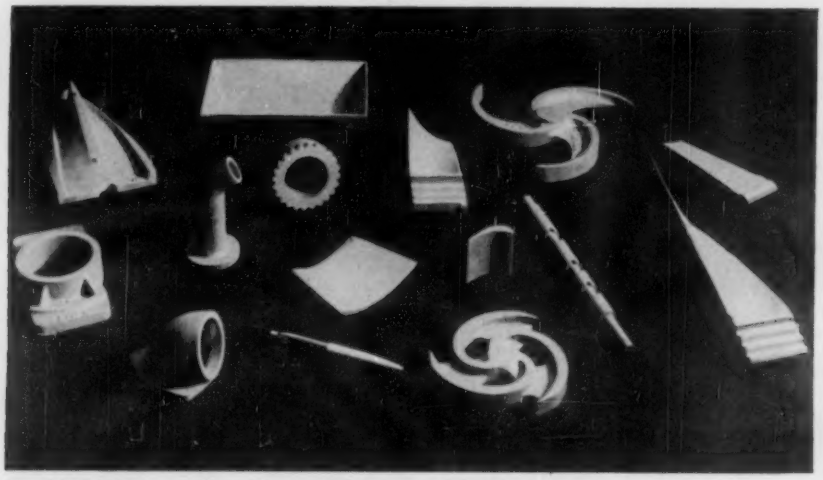
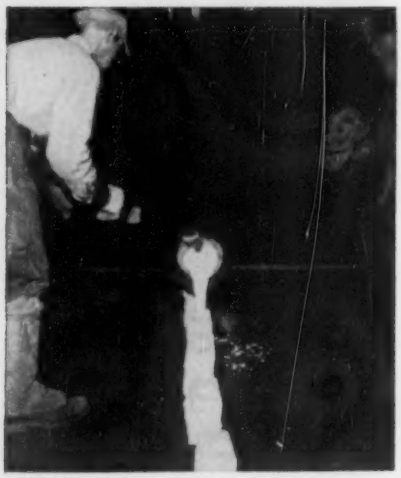


ANY TYPE PATTERN—metal, clay, wood, plastic or combination—can be used in ceramicasting, thus reducing initial costs.



SMALL PARTS as well as those weighing several hundred pounds can be made.



POURING metal in ceramic molds.

Ceramicasting Gives Close Tolerances

By Alpheus W. Jessup

Lebanon, Pa.—Castings with tolerances and finish comparable to those obtained in the lost wax and frozen mercury processes are produced by an economical and fast method being developed by the Lebanon Steel Foundry.

Any type of pattern can be used in Lebanon's "ceramicast" process, thus eliminating the expensive dies required by other precision casting. For runs up to 1,000 to 2,000 pieces, or for parts on which frequent design changes are anticipated, "ceramicasting" promises to be very economical.

Advantages of the process for fine castings as explained by Lebanon's Plant Manager Thomas S. Quinn are:

• **Low cost** of the initial patterns through the use of any type of pattern—wood, plastic, metal, metal and plaster, jobbing wood in clay. Molding costs also may be reduced considerably when the process is established on a full production basis.

• **Speed** with which castings can be turned out. Castings can be produced the same day that a pattern is delivered to the foundry. Small quantities can be made in "a matter of one to two hours."

• **Ease** in making design changes. Because low cost patterns not requiring expansion dips are useable in the "ceramicast" process, changes can be made quickly and at limited cost.

• **All ferrous metals** can be cast. This includes carbon steel, conventional low-carbon alloys, nickel-chromium stainless steels and cobalt-base superalloys.

• **Fine tolerances produced.** Tolerances run from ±.002 to ±.004 inch per inch and ±.011 to ±.012 inch over seven inches. Tolerance across a parting line would be approximately double. But usually this can be cut down by making one part of the mold a flat side. Production of knife-edge parts is feasible.

• **Unlimited size** of castings. "There is virtually no upper limit short of possibly several hundred pounds for the top size of casting which can be made by this method.

Aircraft Parts

Lebanon Foundry considers the process advantageous for the production of jet engine parts (manifolds, housings, blades), landing gear parts (brake backing plates, struts, shock absorber housings) and airframe structural members where ferrous alloys can be used. A typi-

Cornelius

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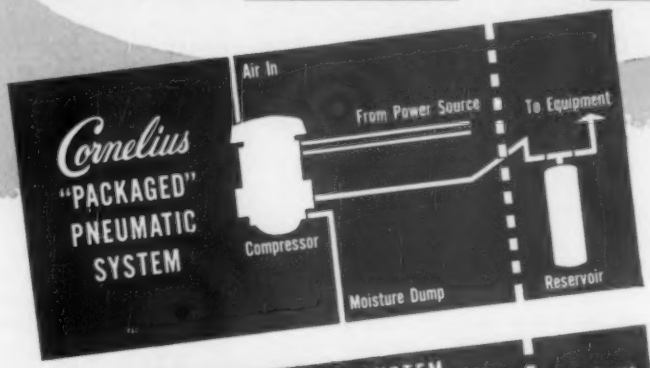
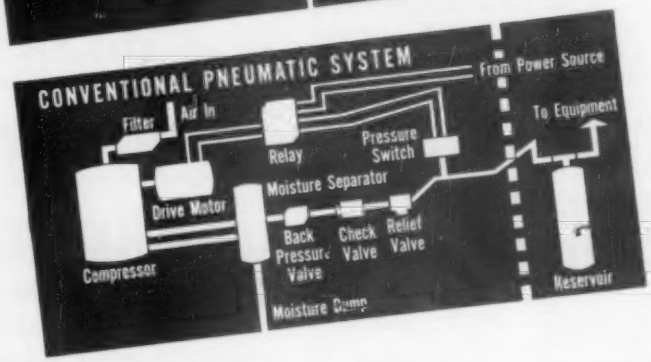
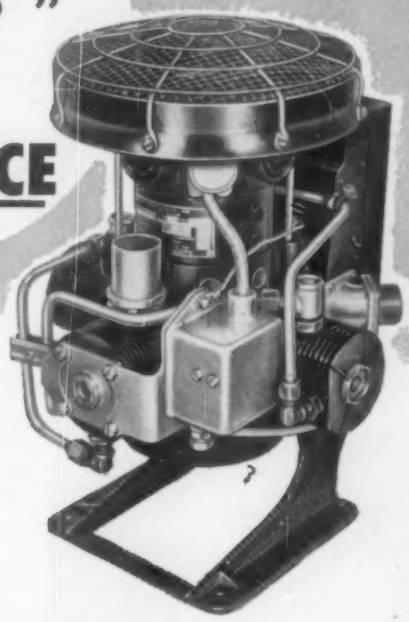






*The Cornelius Compressor, Model 130, 2CFM, 3000 PSI, is used in the McDonnell F2H-3 and F3H, North American FJ-2, FJ-3 and FJ-4, Chance Vought F7U-3, Grumman F9F-9. Also on order for the Lockheed P2V, Grumman S2F and Martin P5M. Thousands of service hours under all operational conditions is proof of outstanding performance.

The Cornelius Model 130 compressor* is the heart of the complete Cornelius "packaged" pneumatic system which includes inlet air filter, starting relay, radio noise filter, moisture separator with automatic condensate dump and heating element, back pressure valve, check valve, relief valve and pressure switch.

Compact Design Saves Space—Entire air supply system occupies only slightly more space than compressor alone in conventional system.

Weight Savings of 5 pounds or more are possible by eliminating separate system components, associated tubing, fittings and flare connections.

System Leakage Is Reduced to a minimum because integration of components removes possible leakage sources such as flare connections and o-ring sealed fittings.

System Reliability Is Assured because each integral component is designed specifically to give optimum performance in combination with the other components.

Time Saved by installation and servicing of *one* unit is another valuable benefit which only Cornelius "packaged" pneumatic systems offer.

The Cornelius "packaged" pneumatic systems are available with either DC, AC or hydraulic motor drives. Please write us in order that a Sales Engineer may discuss with you the application of this "packaged" system as well as the many other pneumatic components which we manufacture.

THE CORNELIUS COMPANY 550 - 39th Ave. N. E., Minneapolis 21, Minnesota

PIONEERS IN THE DEVELOPMENT OF AIRCRAFT PNEUMATIC SYSTEMS

MOLDING material poured onto pattern.

MOLD is stripped from pattern, then . . .

FLAMED-OFF to climinate alcohol.

cal part adaptable to this casting process is a housing which splits into quarters which must be produced as precision castings because a flange prevents machining.

The number required is such that to produce the part by another casting process requiring dies would be much more expensive.

This casting process, also, should be exceptionally valuable, Lebanon believes, to a design engineer. With inexpensive patterns he can obtain cast parts quickly and economically; and as required he can make changes in his patterns, also without expensive diemaking.

Quinn thinks the new process will permit manufacture of many aircraft parts in ferrous alloys using little or no critical alloying materials. This may reverse a little the present trend of many engineers who say "we have to take the part out of steel."

American Method

Actually use of ceramic molds is a British development. There, however, the process has been limited to what amounts to laboratory scale. Lebanon is turning the process into a production operation under the direction of metallurgist Edward Vogel, who has supervised pilot-plant operations for several months.

Vogel outlines the process of making the molds as follows:

• **Preparation of the molding material.** Binder is silimanite (half and half 10/30 AFA fines and 120 flour) and it is mixed with a catalyst, ethyl orthosilicate. Speed with which the mold sets is controlled by the amount of ethyl ortho-silicate used. If too much is used, the ceramic material will set, before it can be poured from the mixing container.

• **Pouring molding material** on the pattern. This is done immediately after the binder is prepared.

• **Flaming-off the alcohol.** The molding material sets very quickly, usually within three or four minutes. As soon as it is set, the mold is stripped from the pattern and set aflame. This burns off most of the alcohol which is formed as a result of the catalysis in the molding material.

• **Firing of the mold.** The molds are placed in a furnace at over 1,000F for 30 mins. per inch of thickness to get rid of the organics. The result is a completely gas-free ceramic mold.

Besides being gas-free, Vogel states that the molds are without blow holes or gas bubbles, and that they have had no trouble with hot tears. The mold is non-collapsible, but crumbles easily under finger pressure. While cleanout and shakeout is not as easy as with sand, it is not difficult.

Lumber Dealer Named To Defense Post

Frank M. Ewing, a Washington, D. C., lumber dealer, has been appointed Deputy Assistant Secretary of Defense for Properties and Installations.

He replaces Rudolph W. Weitz in the position as aide to Assistant Defense Secretary Franklin G. Floete. Ewing, a member of the Lumber Industry Advisory committee to the Secretary of Commerce, was president and board chairman of the Frank M. Ewing Co., wholesale and retail lumber dealers.

A graduate of Yale, he served during World War II as a member of the Retail Lumber Industry Advisory Committee to the War Production Board.

Pacific Air Force Takes Over 13th AF

Command of the 13th Air Force has been changed from the Far East Air Forces to the Pacific Air Force.

Responsibility of the 13th Air Force is being expanded to the Formosa area as well as the Philippine Islands. The Pacific Air Force was established last year to operate Air Force units in Admiral Felix Stump's Pacific Command.

Maj. Gen. Sory Smith commands the Pacific Air Force. He was formerly Director of Information Services at USAF headquarters.

ACC Panel to Study Detroit Air Space

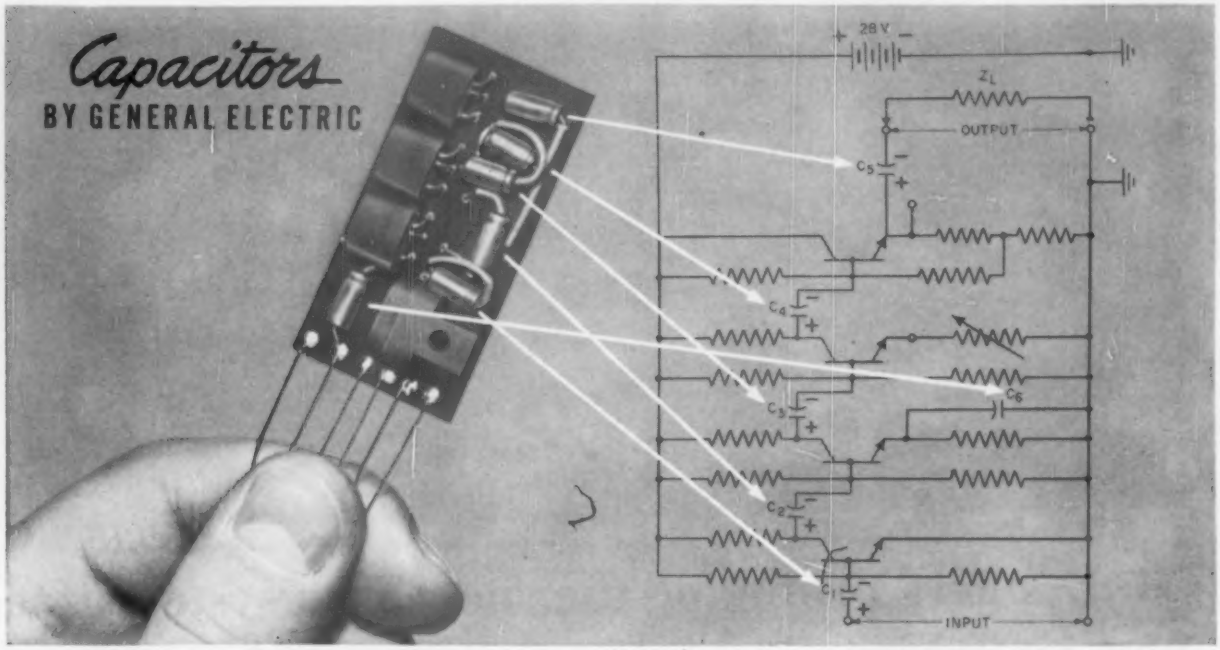
Airport Use Panel of the Air Coordinating Committee has scheduled public hearings in Detroit, Mich., beginning June 22, to determine "the most feasible civil/military utilization of the airports, existing and proposed, in the Detroit area."

The hearings are required, ACC said, as a result of an immediate need of the Air Force and Navy to relocate some of their activities now being conducted at Selfridge AFB and Grosse Ile NAS, because of the inadequacy of present facilities. In establishing the military units on other airports in the Detroit area, the disposition of civil aviation will also be taken into account, the committee stated.

Gage Checks Blades

Guillotine gage for checking accuracy of jet engine blades can test up to 10 different features; parts can be changed on the spot, the manufacturer states.

The gage is produced by Winslow Manufacturing Co., Cleveland 14, Ohio.



New RC coupled, silicone transistor servo amplifier was developed for aircraft and guided missile applications. Small size of six G-E Micro-miniature Tantalytic* capacitors permitted size reduction to .68 cubic inches.

COMPACT SIZE, DEPENDABILITY, CREATE . . .

New use for tiny G-E Tantalytic capacitors in subminiature plug-in servo amplifier

Six G-E Micro-miniature capacitors rated at 8 microfarads and at 4 volts are used by the engineers at Plastics and Electronics Corp., Buffalo, N. Y., in their new RC servo amplifier. The $\frac{1}{8}$ by $\frac{5}{16}$ inch dimensions of the tiny capacitors enable the amplifier to be assembled and encapsulated in plastic in a 1 by 2 by $\frac{1}{3}$ inch space.

Five of the capacitors (C1 to C5 above) are used for coupling while the sixth (C6) is for bypassing.

Because the amplifier was designed for critical aircraft and missile applications, capacitors were needed which combined small size, high ratings, and reliability.

"We chose G-E Tantalytic capacitors because they were the smallest, most dependable units with the high capacitance required for low impedance transistor devices," said Plastics and Electronics' chief engineer, Thomas L. Robinson.

If you have a design problem calling for an extremely small, high microfarad capacitor (particularly for transistorized circuits) fill out the coupon below. We will send you complete specification data and descriptive information on G-E Micro-miniature Tantalytic capacitors. For specific application information, contact your nearest G-E Apparatus Sales Office.

*Registered trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric Co.
Section D442-26
Schenectady 5, N. Y.

Please send me Micro-miniature Tantalytic Bulletins GEA-6065 and GET-2405.

Name.....**Title**.....

Company.....

Address.....

City.....**Zone**.....**State**.....

G-E exhaust gas thermocouples are easy to install and service. Have been proven in 6,000,000 hours of operation.

G.E. offers prototype thermocouple systems for new jet engines in record time . . . without charge

General Electric is now ready to provide a prototype gas thermocouple system for your aircraft gas turbine without charge. Whether rigid or flexible type, these systems can be designed to meet almost any requirement. Past prototype systems have been delivered for installation within 24 hours after date of original request.

Advantages of G-E thermocouples

Manufactured by the G-E Instrument Department in West Lynn, Massachusetts, your General Electric prototype thermocouple will have these advantages:

1. Lighter weight, because of self-supporting harness—there is no need to install extra mounting brackets on the tail pipe. This reduces installation cost and weight.
2. Greater reliability—because of fewer connections, G-E exhaust gas thermocouples are less apt to develop connector failures.
3. Fewer service problems—the thermocouple harness assembly and leads consist of only 3 pieces which makes for easier installation and reduces chance of lost parts.

Better construction

Every G-E thermocouple system is insulated with compacted magnesium oxide powder enclosed in a stainless steel tubing. This construction withstands ambient temperatures of at least 1000 F.

Proven In Service

More than 6 million flying hours have already been logged with jet engines using G-E exhaust gas thermocouples. They are used both in systems that indicate and in those that automatically control the temperature. The temperatures are normally in the 1200 F range with transients up to and above 1600 F.

For further information on ordering a prototype gas thermocouple system to fit your requirements, see your nearest G-E Apparatus Sales representative. Send in coupon below and check off "A" to get bulletin GEC-1297, for a rundown on the complete line of systems offered.

400-cycle alternator meets tough guided missile demands

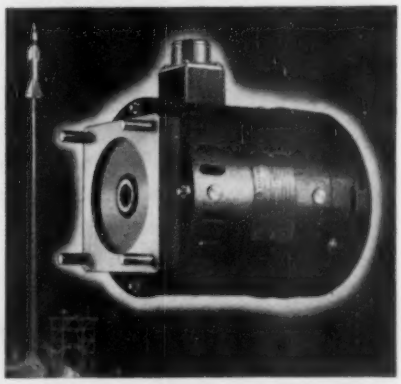
Developed to withstand the tremendous range of shock, temperature and atmospheric conditions encountered in guided missile applications, the G-E explosion-resistant 400-cycle alternator meets rigid environmental and military specifications (MIL-E-5272A). Rated up to 1500 volt-amperes, 12,000 rpm, for output of 115 or 208 volts, the unit is designed to be driven by a wide variety of motor, turbine, and ram-air drives.

The alternator can be readily coupled to a drive unit with an AND 10261 or AND 20001 mounting pad. Modifications of these mounting pads can be made to meet specific application requirements. The unit is very versatile in both construction and application, and can be manufactured to produce more output when required.

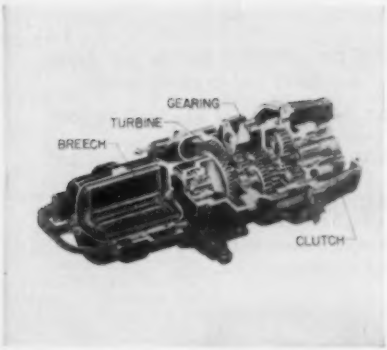
Weighing only fourteen pounds when equipped with the AND 20001 mounting pad, the new alternator is a lightweight unit having an unusually high power.

To meet requirements of MIL-E-5272A regarding altitude, shock, temperature, vibration, humidity, foreign elements, and centrifugal force, the alternator underwent exhaustive testing—a standard procedure for all G-E aircraft and armament motors.

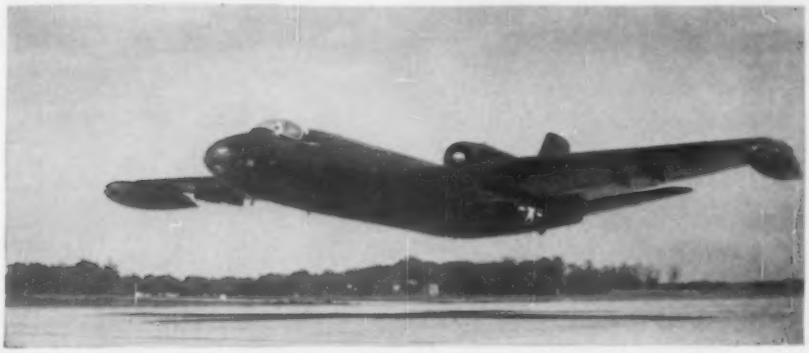
For more information on how this motor can satisfy your aircraft and armament problem, check "C" in coupon for GEA-6269B, and return to address indicated. Remember—your specifications are all that G-E engineers need to handle your toughest requirements.



New 400-cycle alternator passed rigid testing to meet specs regarding altitude, shock, temperature, vibration, humidity, sand and dust, and centrifugal force. General Electric offers hundreds of other type motors to meet any aircraft requirement.



Cutaway view of cartridge starter for jet engines shows main operating parts.



B-57 takes off after fast start with General Electric cartridge turbo starter. Pilot is able to get immediate highly dependable starts at the push of a button. Starter torque output is relatively constant providing rapid start without damage to jet engine gear train.

Cartridge starter turns over Martin B-57 jets fast for quick takeoff

A small General Electric cartridge starter that will kick off the Air Force's Martin B-57 for a quick takeoff is now in operation.

The new starter, known as Model S-12, uses a solid propellant charge which is ignited electrically at the push of a button. The rapid burning of this charge provides hot gases which turn a small turbine wheel. This wheel is engaged through a reduction gear system and clutch to start the pump's jet engine power plants.

Allows Take Off From Any Airfield

Importance of the cartridge turbo starter is that it permits fast starts on planes scattered over any part of any airfield, without ground power, since no ground power units are needed for starting. Every B-57 carries it own engine starting power. Further information on this starter can be obtained from your nearest G-E Apparatus Sales representative, or by checking "B" on coupon below and mailing in for bulletin GEA-5872A.

G-E transformer rectifier designed for reduced weight

Aft compartment of B-36 shows G-E transformer rectifier mounted for easy inspection.

Converting a-c power to d-c on the Convair built Air Force B-36 are General Electric airborne transformer rectifiers. The units are designed to offer a lightweight means for obtaining on-the-spot direct current required for the d-c equipment, and eliminate the long, heavy d-c bus runs and d-c generating equipment which would otherwise be required.

Transformer rectifiers to your applications

These transformer rectifiers, as well as the other models now being currently produced by G.E., offer a lightweight, highly dependable, flexible source of direct current, and require a minimum of maintenance. G.E. now covers a range of applications for 208 volt a-c aircraft power supplies ranging from 1 amp to 200 amps, both regulated and unregulated. Regulation is accomplished by means of magnetic amplifiers. D-c output can be filtered to meet almost any ripple specification. Efficiency varies between 72½% and 85% depending on conditions of operation and the type of unit.

Designed for your requirement

Regulated units can be paralleled with each other or with a d-c generator. Cooling is done by convection, or fan. Protective features such as undervoltage relays and overvoltage relays can be provided.

For further information on these new lines of transformer rectifiers, see your nearest G-E Apparatus Sales representative. General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Mail to:
Section A210-95
General Electric Company
1 River Road
Schenectady 5, N. Y.

- ☐ "A" Exhaust-Gas Thermocouples, GEC-1297
- ☐ "B" Aircraft Gas Turbine Starters, GEA-5872A
- ☐ "C" New 400-Cycle Alternator, GEA-6269B

Name..... Position.....

Company..... ☐ For immediate project

Street..... ☐ For reference

City..... Zone..... State.....

NEW G-E AIRCRAFT MOTOR MET THESE AIRCRAFT RADIO CORP. SPECS:

- 1 oz-in. output at 120 rpm: 28 volts input
- Minimum brake life: 150 hr at 40,000 ft, 50 hr at sea level
- Brake must stop motor within 45 degree rotation of output gear
- Weight, not over 0.94 lb
- Continuous duty cycle

A. W. Parkes, Jr., Vice President, Aircraft Radio Corporation says—

"New G-E aircraft motor designed for us stands terrific shock, extreme temperatures"

"We recently went to General Electric for a top-grade aircraft motor for remote tuning of an aircraft radio receiver we were designing," Mr. Parkes goes on to say. "G.E. came up with a motor that operates dependably and smoothly at temperatures ranging from −50C to +70C. At the same time, of course, the motor stands up under humidity, vibration, and the shock accompanying aircraft operation under both normal and combat conditions.

"In dealing with G.E., we especially like the teamwork possible between G-E sales and application engineers and our engineers. G-E sales and application engineers worked right in our plant and Aircraft Radio Corporation engineers went to the G-E plant to take advantage of extensive environmental testing equipment there. We're sold on the value of such application help."

TO SERVE YOU, General Electric offers application engineering experience like that provided the Aircraft Radio Corporation—experience gained through years of helping solve difficult aircraft and armament problems. Contact your local G-E Apparatus Sales Office early in your planning. For more information, write today to Section 704-53, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

USAF Contracts

Following is a list of recent contracts announced by USAF.

Bendix Products Div., Bendix Aviation Corp., South Bend, Indiana, rotors, 100 ea., $38,210.

Riverside Box Co., Bloomington, Ill., containers, wooden, rocket components, 210,125 ea., containers, wooden, rocket components, 210,125 each., $396,505.

Norris-Thermador Corp., Vernon, Calif., tanks, cartridge, 330,285 ea., covers, tank, for 50 cartridge, 50,000 ea., $1,562,343.

Waycross Machine Shops, Waycross, Ga., containers, aluminum for emergency identification signal, 10,000 ea., $178,000.

Bulova Research and Dev. Lab., Inc., Woodside, N. Y., design and fabrication of one missile firing panel for DDG, $53,500.

Wilcox Electric Co., Inc., 14th and Chestnut Sts., Kansas City, Mo., transmitting set, 246 ea., $1,971,513.

Northern Radio Co., Inc., 154-145 W. 22nd St., New York 11, N. Y., Model 2 tone converter, 1,140 ea., carrier TG rack dual freq. shift., 449 ea., $1,095,362.

Dresser-Ideco Co., 875 Michigan Ave., Columbus 8, Ohio, tower, steel, 200 ea., $844,800.

Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y., cable-RF coax, 1,177,895 ft., $840,781.

Olympic Radio and T.V., Inc., 34-01 38th Ave., L. I. City, N. Y., recorder reproducers, 1,084 ea., demagnetizer, 410 ea., $724,907.

Anaconda Wire and Cable Co., 1 River St., Hastings on Hudson, N. Y., cable-RF, 858,000 ft., $615,186.

Roanwell Corp., 662 Pacific St., Brooklyn, N. Y., electric headset, 17,537 ea., $515,237; headset, 12,000 ea., $504,800.

Hallamore Mfg. Co., 2001 East Artesia St., Long Beach 5, Calif., branching amplifier, 1,394 ea., $420,364.

Recony Corp., 150 Nassau St., New York, N. Y., kit, trailer, 93 ea., $386,597.

Nems-Clarke, Inc., 919 Jesup-Blair Dr., Silver Spring, Md., panel-power, 236 ea., $166,340.

Philco Corp., 4700 Wissahickon Ave., Phila., Pa., modification kit, 1,549 ea., $123,127.

Rome Cable Corp., Ridge St., Rome, N. Y., cable, 133,000 ft., $84,492.

Lewis Engineering Co., 339 Church St., Naugatuck, Conn., wire-electric, 467,000 ft., $83,125.

Rola Co., Inc., 2530-70 Superior Ave., Cleveland, Ohio, microphone, dynamic, 4,221 ea., $70,504.

Brad Harrison Co., 4222 Warren Ave., Hillside, Ill., cable-assy., 600 ea., $69,582.

Okonite Co., Passaic, N. J., cable, 81,500, ft., $64,525.

Dresser-Ideco Co., 875 Michigan Ave., Columbus 8, Ohio, arctic tower, 3 ea., $58,320.

Collyer Insulated Wire Co., 249 Roosevelt Ave., Pawtucket, R. I., wire, electric, 146,000 ft., $48,528.

Multi Electric Mfg., Inc., 4223 E. Lake St., Chicago 24, Ill., traffic light, 434 ea., table 250, 1 set, $42,966.

General Electric Co., Electronics Park, Syracuse, N. Y., modulator-radar, 2 ea., cabinet, houses, 4 ea., $39,370.

Wm. A. Knapp Co., 714 Independence Ave., Kansas City, Mo., pump drum, hand operated, piston type for gasoline or kerosene, 2,446 ea., $30,599.

Aluminum Cooking Utensil Co., Inc., Fifth Ave., and Eleventh, New Kensington, Pa., pot, cooking, 30 qt. cap., 2,070 ea., $87,391; boiler, double, 38 ea., $735.

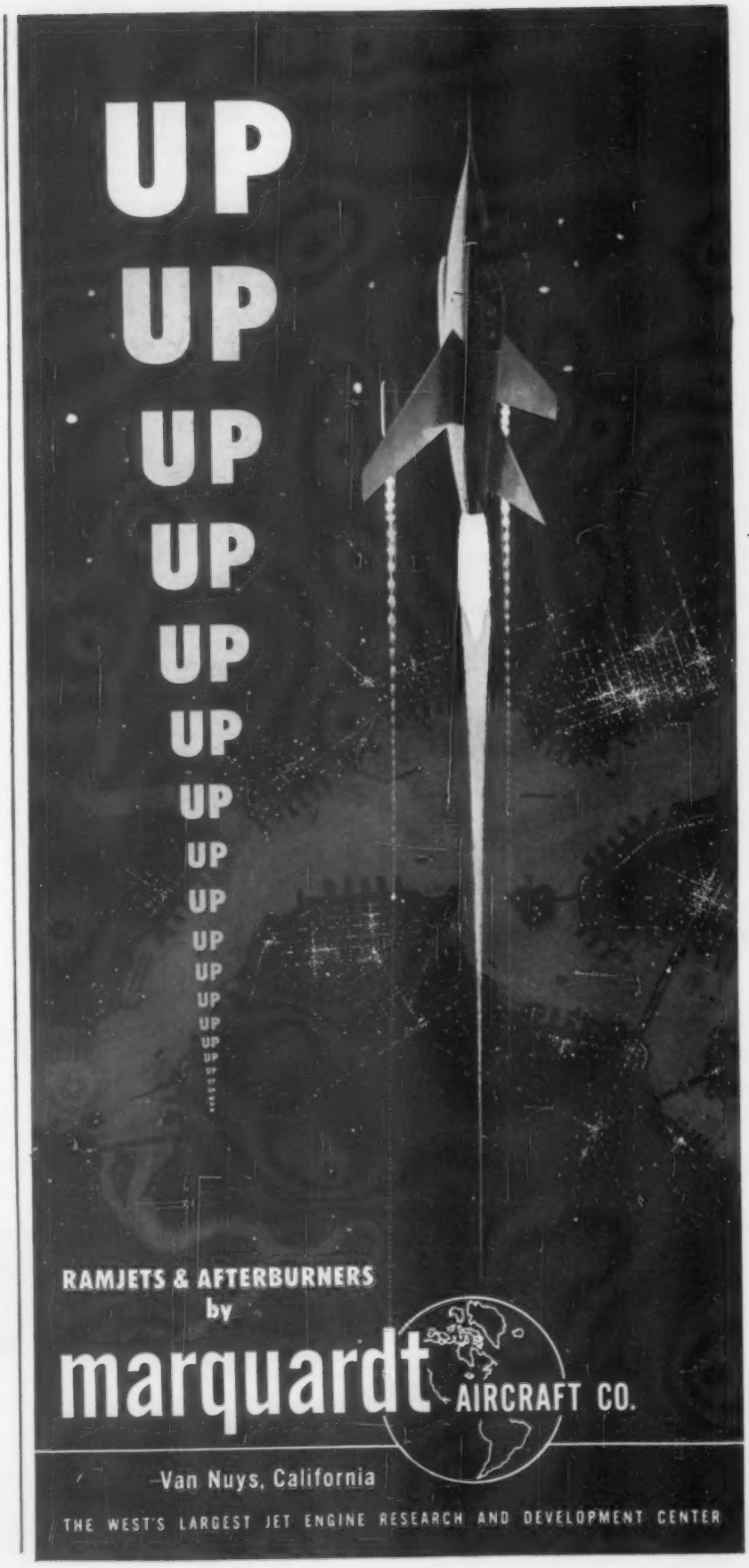
Interstate Box Co., P.O. Box 32, Columbus, Miss., pin, tent, wood, 16", 573,000 ea., $42,402; pin, tent, wood 16", 975,000 ea., $72,150.

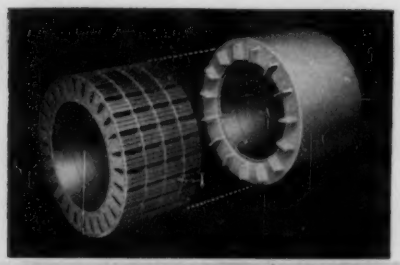
B. K. Sweeney Mfg. Co., 1601 23rd St., Denver, Colo., anchor plate, 828 ea., $33,558.

Bliss and Laughlin, Inc., Harvey, Ill., steel rod, 570,556 lbs., $58,498.

Rohm & Haas Co., Bristol 5, Pa., plastic, 13,737 sht., $182,126.

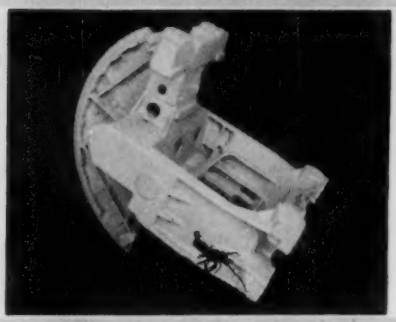
(*Continued on p. 100*)





MAGNETIC OUTPUT BOOSTED 10% BY ROLLE MFG. CO.

Rolle advanced casting techniques keep permanent magnet insert temperatures down, yet assure a sound permanent mold aluminum casting. As a result, magnetic output of this alternator rotor is up 10% over best previous attempts.



NIGHTMARE SPECIFICATIONS MET BY ROLLE MFG. CO.

Complicated internal structure, unequal wall sections, complex wall joinings, intricate internal webbing, make feeding and chilling stressed areas a nightmare in this sand casting. But Rolle Manufacturing is turning out castings able to pass 100% X-ray examination to highest aircraft standards in production quantities.

CASTING COSTS CUT 44.5% BY ROLLE MFG. CO.

Rolle recommended change from sand casting to permanent mold casting of this part, with guaranteed surface in required areas, between fins, of from 100 to 125 microinches. Change resulted in casting costs down 44.5%, and machining time cut in half.

ROLLE CAN SOLVE YOUR CASTING PROBLEMS

Your casting problems—sand or permanent mold, aluminum or magnesium alloys—can always be solved quickly and economically if you bring them to Rolle. But the advantages of fighting weight with strength with Rolle don't stop there. Some of the most impressive savings Rolle has made for customers involved castings that were never considered "problems."

You can get some idea, just from the few cases illustrated here, of how the use of advanced techniques . . . a change in casting method . . . variation in any of a hundred casting considerations, can bring immediate returns in either reduced costs or improved performance, or both.

Write now for a free booklet that tells how you can solve casting problems with Rolle.

FIGHT WEIGHT WITH STRENGTH with **ROLLE** MANUFACTURING COMPANY

309 Cannon Avenue Lansdale, Penna.

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

Beech Aircraft Corp., Wichita 1, develop and manufacture target drones, 9 ea., $199,500.

Bendix Aviation Corp., Eclipse-Pioneer Division, Teterboro, N. J., fuel flow transmitters, 954 ea., $184,590; air turbine starters, 333 ea., $489,121; gyro horizon indicators, 936 ea., $1,137,371.

Emerson Electric Mfg. Co., 8100 Florissant, St. Louis 21, technical professional services for field instruction of Naval and Marine Corps personnel in servicing gun turrets, $26,818.

Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y., perform work necessary to disconnect, remove, pack, crate and preserve machine tools and capital equipment, $50,000.

Jamestown Metal Corp., 3344 Chadakoin, Jamestown, N. Y., aerological display equipment sets, 6 ea., $35,278.

Magnavox Co., Fort Wayne, Ind., developmental models of sixteen-channel signal generators, 5 ea., $82,873.

Pacific Airmotive Corp., 2940 N. Hollywood, Burbank, Calif., cabin pressure regulator testers, 7 ea., $66,579.

Radioplane Co., 8000 Woodley Ave., Van Nuys, Calif., design, develop, fabricate and furnish improved parachute assemblies, 3 ea., $50,726.

Wollensak Optical Co., Rochester 21, N. Y., design, fabricate and furnish 70-mm. portable copy camera, 1 ea., $44,000.

Hub Paint and Varnish Co., 47-58 Fifth St., Long Island City 1, paint, 29,580 gal., $49,399.

Berger Bros. Co., 135 Derby Ave., New Haven 7, Conn. anti-blackout suits, 1,745 ea., $64,460.

Scintilla Div., Bendix Aviation Corp., Sherman Ave., Sidney, N. Y., maintenance parts, $41,841; $26,998.

Arrowhead Rubber Co., 2350 Curry St., Long Beach, Calif., maintenance parts, $46,115.

Turco Products, Inc., 95 Fairmount Ave., Philadelphia 23, compound, 12,000 gal., $31,680.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif., maintenance parts, $28,629.

Glenn L. Martin Co., Baltimore 3, maintenance parts, $60,836.

AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., maintenance parts, $33,919; oil coolers, $42,969.

United States Rubber Co., 407 N. Main St., Mishawaka, Ind., maintenance parts, $42,195.

Curtiss Propeller Div., Curtiss-Wright Corp., Caldwell, N. J., services, $47,000.

Rohm & Haas Co., 222 W. Washington Sq., Philadelphia 5, Pa., plastics, $57,175.

Aerol Co., Inc., 1731 Workman St., Los Angeles 31, wheel assy., 1,626 ea., $40,569.

Westinghouse Electric Corp., 3001 Walnut St., Philadelphia 4, drive assy., 956 ea., $41,251.

General Electric Co., 1405 Locust St., Philadelphia, generators, $97,883.

George Senn, Inc., 2200 E. Westmoreland St., Philadelphia 34, compound, $49,232.

Turco Products Inc., 6135 S. Central Ave., Los Angeles 1, compound, $61,967.

Benj. Franklin Paint and Varnish Co., 4820 Langdon St., Philadelphia 24, enamel, $50,101.

Hub Paint and Varnish Co., Inc., 47-38 Fifth St., Long Island City 1, enamel, $46,020.

General Paint Corp., 2627 Army St., San Francisco 19, enamel, 37,750 gal., $90,600.

Hiller Helicopters, 1350 Willow Rd., Palo Alto, Calif., spares used on H-23 aircraft, $33,824.

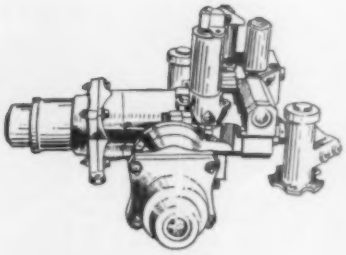
Jetronic Industries Inc., Main and Cotton Sts., Philadelphia 27, radar test sets, 54 ea., $47,634.

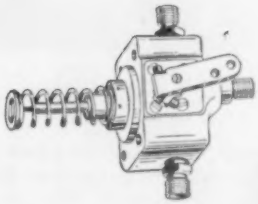
Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, maintenance parts used on R5D aircraft, $49,745.

Micro-Precision

DESIGN
TESTING
DEVELOPMENT
MANUFACTURING

Service





COMPLETE ENGINEERING and processing service on all types of high precision parts . . .

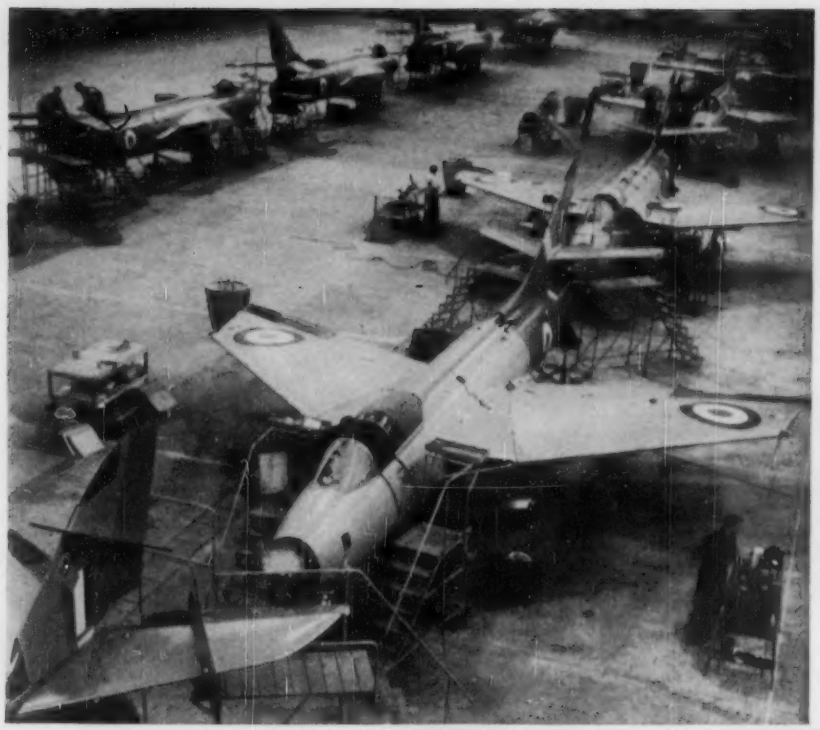
A staff of experienced design and testing engineers with facilities for testing and developing functional parts to your specifications . . .

A new modern plant equipped with the latest precision generating machines—and mechanics with the know-how to transform tool makers' methods and gauge-makers' precision into mass production methods . . .

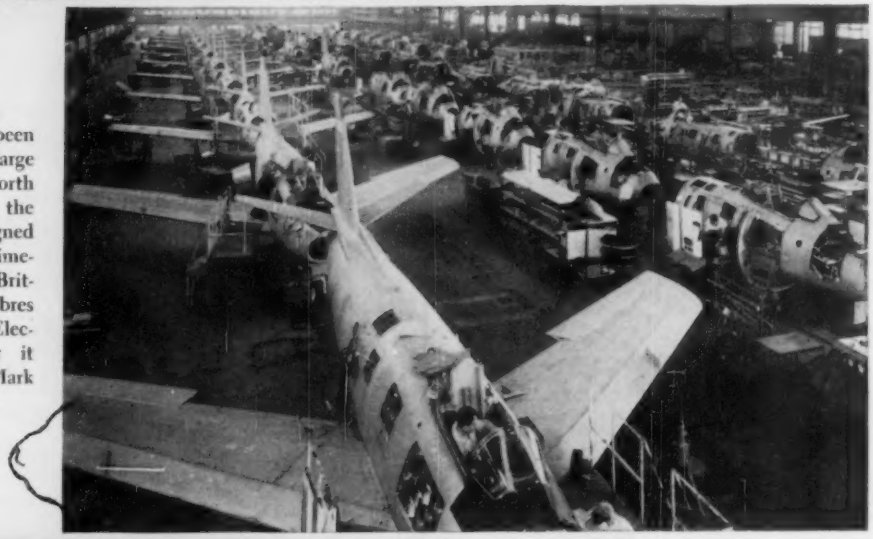
Whether you are interested in system control components for aircraft, servo-mechanisms, hydraulic or pneumatic prime mover controls, diesel fuel injection equipment or other parts that require high precision—a letter or phone call to Micro-Precision will assure you of prompt, courteous attention.

MICRO-PRECISION DIV.
MICROMATIC HONE CORPORATION
2205 Lee Street, Evanston, Illinois • Davis 8-6771
1535 Grande Vista, Los Angeles, Cal. • ANgeles 1-0309

NATO Fighters In Production



SHARP CONTRAST in British and Canadian fighter production is shown in photos comparing Hawker Hunter (left) and Canadair Sabre assembly lines (below). The wide-spaced Hunter line at the company's Blackpool plant follows standard British practice; the closely packed Canadair facility resembles U. S. mass-production techniques. The Hunter is still in development and output has been delayed to make design changes during production as shown necessary in flight test programs. The British believe that their system permits such changes to be incorporated faster and easier than under a fast production buildup. The Blackpool plant, a former wartime satellite factory, was converted especially to boost Hunter output. Approximately 200 of the sweptwing fighters have been delivered to RAF.



WELL OVER 1,200 SABRES have been produced by Canadair, Ltd., at its large Montreal facility under license from North American Aviation, Inc. In addition to the F-86 it is also turning out Lockheed-designed T-33 two-seat jet trainers and a maritime-reconnaissance version of the Bristol Britannia. Canadair has been building Sabres since 1949, beginning with the General Electric J-47-powered version. Last year it switched to the Avro Orenda-powered Mark 5 and 6 models.

LARGE FLIGHT HANGAR, measuring 739x234x46 ft., at Canadair, Montreal, can service 50 Sabres or T-33s or store 70 of these planes. Sabres in the foreground are painted with glossy RCAF camouflage and have the 6-3 slatless wings developed by North American Aviation during the Korean war. The T-33s in the background, also for the RCAF, are powered by the Rolls-Royce Nene. Upstairs, the hangar contains offices, sales and service training schools and a dispatcher's facility for controlling movements of aircraft.

Systems Development and The Ramo-Wooldridge Corporation

The Ramo-Wooldridge Corporation (except for the specialized activities of our subsidiary, Pacific Semiconductors, Incorporated) is engaged primarily in developing—and will soon start to manufacture—systems rather than components. For military customers our weapons systems responsibilities are in the fields of guided missiles, fire control, communications, and computers. Our non-military systems activities are in the general area of automation and data-processing.

Emphasis on systems development has consequences that profoundly affect all aspects of an organization. First, it demands an unusual variety of scientific and engineering talent. A single systems development project often requires concurrent solutions of challenging problems in the fields of electronics, aerodynamics, propulsion, random phenomena, structures, and analytic mechanics. In addition, the purely technical aspects of a systems problem are often associated with equally important nontechnical problems of operational, tactical, or human relations character.

Therefore, competent systems development requires that a company contain an unusually large proportion of mature, experienced scientists and engineers who have a wide range of technical understanding and an unusual breadth of judgment. Further, all aspects of company operations must be designed so as to maximize the effectiveness of these key men, not only in the conduct of development work but in the choice of projects as well.

At Ramo-Wooldridge we are engaged in building such a company. Today our staff of professional scientists and engineers comprises 40% of the entire organization. Of these men, 40% possess Ph.D. degrees and another 30% possess M.S. degrees. The average experience of this group, past the B.S. degree, is more than eleven years.

We believe the continuing rapid growth of our professional staff is due, in part, to the desire of scientists and engineers to associate with a large group of their contemporaries possessing a wide variety of specialties and backgrounds. It is also an indication that such professional men feel that the Ramo-Wooldridge approach to systems development is an appropriate one.

We plan to continue to maintain the environmental and organizational conditions that scientists and engineers find conducive to effective systems development. It is on these factors that we base our expectation of considerable further company growth.

POSITIONS ARE AVAILABLE FOR SCIENTISTS AND ENGINEERS IN THESE FIELDS OF CURRENT ACTIVITY:

Guided Missile Research and Development
Digital Computer Research and Development
Business Data Systems Development
Radar and Control Systems Development
Communication Systems Development

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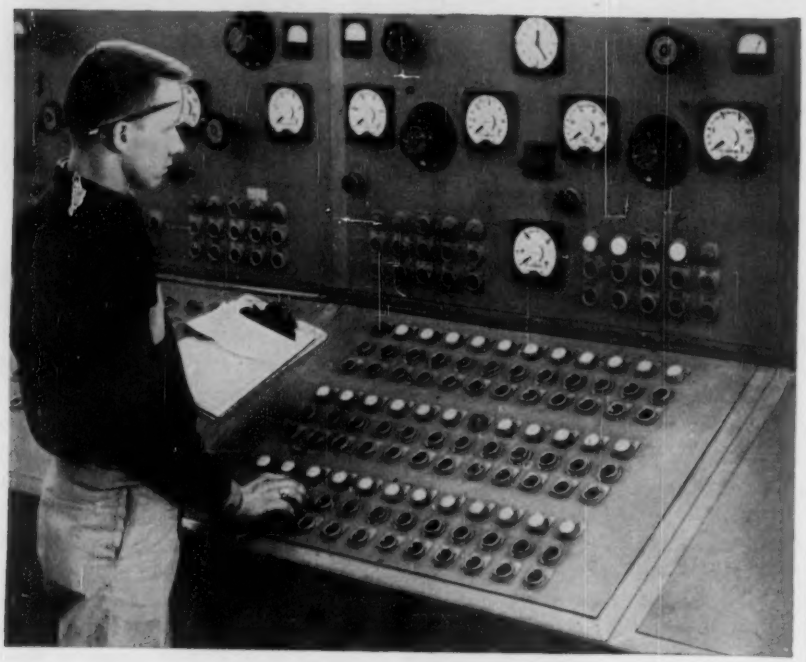
MALLORY·SHARON reports on

TITANIUM



What's this?

WE'RE MAKING METAL BY PUSHBUTTON!

• The familiar sights of steelmaking are strangely absent in a titanium plant. The melting crucibles must not only be completely enclosed, but maintained under vacuum, to prevent contamination of the molten titanium by gases. And the crucible requires special cooling, otherwise it would react with the titanium it holds.

In Mallory-Sharon's new titanium melting plant, production methods have been refined further, with all melting operations remotely controlled by pushbutton. This assures safety and provides the strictest control of processing possible. The result is consistently high quality and uniformity in the titanium and titanium alloy mill products which Mallory-Sharon produces.

Mallory-Sharon's technical leadership, in research and production techniques, is good reason for you to call us in your applications of lightweight, corrosion-resistant titanium.

Mallory-Sharon Titanium Corporation, Niles, Ohio.

MALLORY Ti SHARON

WHO'S WHERE

(*Continued from page 9*)

Paul E. Hovgard, research and development director, Kellett Aircraft Corp., Camden, N. J.

Robert A. Averitt, manager of aviation systems engineering for General Electric Co.'s aviation and defense industries sales department, Schenectady, N. Y.

James E. Bevins, assistant engineering director, Bendix Aviation Corp.'s Eclipse-Pioneer Division, Teterboro, N. J. **C. D. Flanigen,** chief engineer of the Utica Division.

Glyn A. Neff, project chief for data processing systems, Consolidated Engineering Corp.'s Systems Division, Pasadena, Calif.

James W. Browder, design specialist in Ryan Aeronautical Co.'s electronics engineering department.

Eugene V. Myers, chief accountant, Dallas Aero Service.

R. Sherman Platt, legal counsel, Solar Aircraft Co., San Diego.

J. George Piccoli, labor relations manager, Republic Aviation Corp., Farmingdale, N. Y.

Arthur Kramer, superintendent of sales and traffic, Canadian Pacific Airlines.

Carl Dunlap, sales manager for both Missile Research Manufacturing Corp. and Network Electronics Corp. Also appointed by the two Van Nuys, Calif., companies: **Herbert Brown,** manager of finance.

John Yule, sales manager, T. R. Finn & Co.'s Electronics Division, Hawthorne, N. J.

Louis B. Peltier, West Coast manager of contractural engineering for United Aircraft Products, Inc.

L. Wayne Mullane, Philadelphia-Burlington regional manager for Rheem Manufacturing Co.'s Government Products Division.

F. Glen Nesbitt, assistant sales manager-flight and engine instruments, and **Vincent F. Acri,** assistant sales manager-flight control systems, Sperry Gyroscope Co.'s Aeronautical Equipment Division, Great Neck, N. Y.

John J. Lillis, Los Angeles district sales manager, Pan American World Airways.

Eugene J. Moscaret, manager of Consolidated Engineering Corp.'s Buffalo, N. Y., district sales and service center.

William D. Ferguson, assistant to the general sales manager, United Air Lines.

B. J. Talbot, director of sales development, Northwest Orient Airlines.

V. V. R. Symonds, sales manager for Bristol Aeroplane Co. of Canada's Aircraft Division at MacDonald Bros. Aircraft, Ltd., Winnipeg.

John C. Christian, manager of plans and programs for defense operations, Avco Manufacturing Corp.'s Crosley Division, Cincinnati. Christian formerly was chief of Boeing Airplane Co.'s armament staff unit.

Morris Silverman, advertising sales promotion manager, Barry Controls, Inc., Watertown, Mass.

Fred M. Segerstrom, transportation sales manager, and **Hugh W. Paul,** manager of technical sales service, L.O.F. Glass Fibers Co., Toledo, Ohio.

Lee R. Urquhart, superintendent of purchasing and stores, Dallas Aero Service.

Robert T. Sidney, member of the public relations staff, Mohawk Airlines.

Herbert Hopkins, engineering test pilot, North American Aviation, Los Angeles.

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Help Keep the Aviation Industry Going Up!
General Electric offers a complete line of aircraft instruments to help solve the constant need and desire of the aviation industry for dependable instrumentation. "Slipvision"* on the following pages will give you—in the shortest amount of your valuable time—a complete story of three typical General Electric instruments.
*Reg. Trademark, General Electric Company
GENERAL ELECTRIC

G-E "Precision Plus" Instruments Serve

IMPROVING MAGNETS and magnetic circuits — the heart of electric instruments — is just one of many benefits incorporated into General Electric aircraft instruments from the seventy years experience of the G-E West Lynn, Mass. Measurements Laboratory. In designing and producing G-E aircraft instruments, all adaptable electric instrument improvements are utilized to provide product quality that more than meets the growing needs of our modern aviation industry. Three typical models are featured at the right to show—through *"Slipvision"* how G-E aircraft instruments are now serving throughout the whole aviation industry.

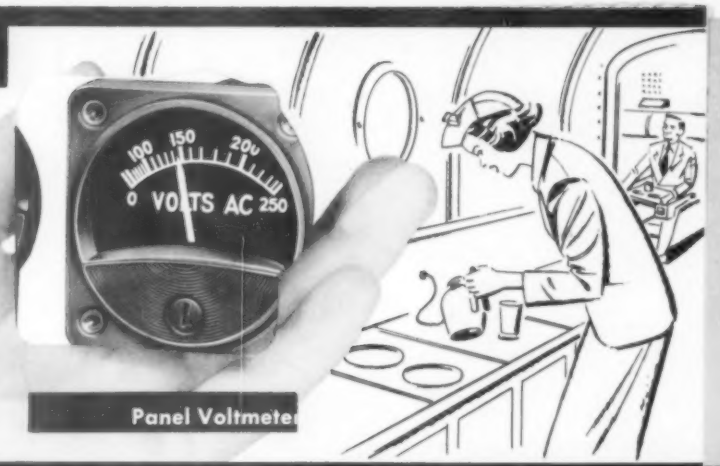
Both Commercial and Military Aircraft

use "Slipvision" below and see why...

ELECTRICAL QUANTITIES INDICATORS

G-E offe hairline acc racy and ve satility of a plication i all aircra instruments.

G-E electrical quantity indicators accurately measure current, voltage, power, or frequency in commercial and military aircraft. Instantaneous readings are given of current being used during such operations as meal time, landings, or warming up periods. G-E offers a complete line of a-c and d-c dependable indicating instruments.



Panel Voltmete

ENGINE SPEED INDICATORS

Rigid facto testing of G aircraft i struments a sures mo reliability.

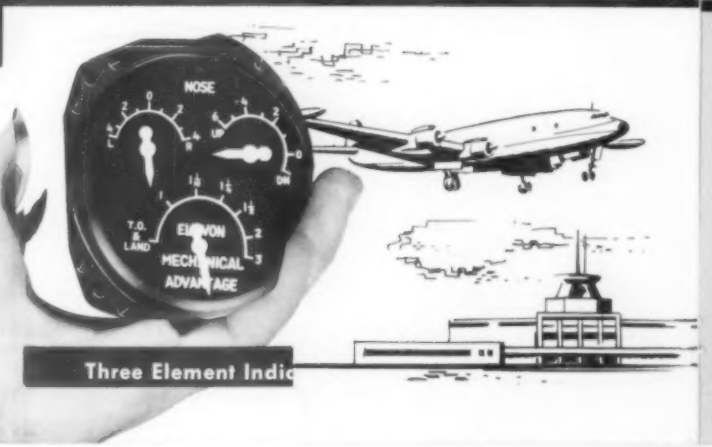
G-E engine speed indicators have easy-to-read scales which show jet or piston engine rpms on one, two, or four engine planes. Accuracy is assured within a plus or minus 25 rpms at 25 degrees C, to 3000 rpm. Two indicators can be connected in parallel operation without sacrifice of accuracy, and instruments are interchangeable.

Percent RPM Indic

POSITION INDICATORS

G-E instr ments a rugged in d sign for lon range servic minimum maintenance

G-E position indicators show position of landing-gear, landing-flaps, wing-flaps or horizontal-stabilizers, to name a few typical examples. G-E aircraft instruments fulfill rigid military and commercial specifications and pass rugged environmental tests. Clear readability is assured with fluorescent-luminescent paint on all G-E dials.



Three Element Indic

Progress Is Our Most Important Product

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More G-E Aircraft Instruments

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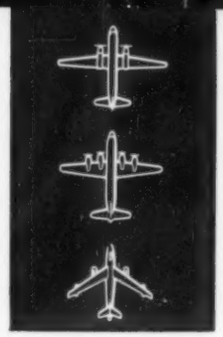

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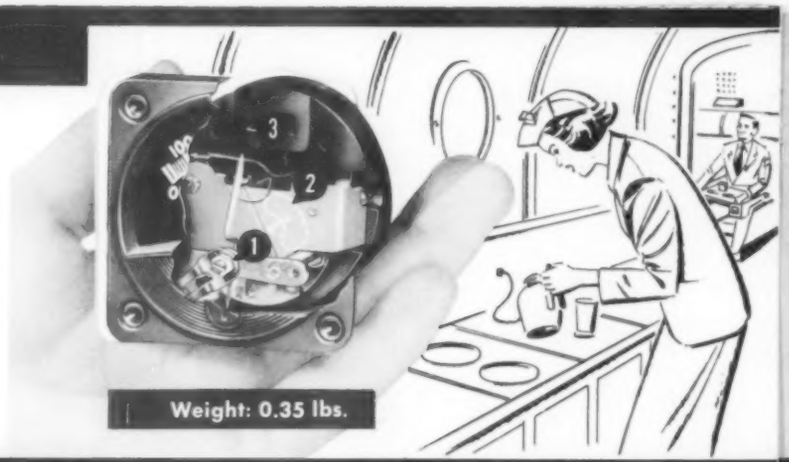
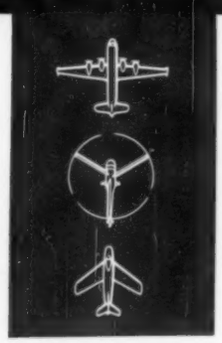


HOLDS ACCURACY

1. Use of large-radius, hardened-steel pivots gives more resistance to aircraft vibration.
2. Highly damped mechanism responds quickly to changes in quantity being measured.
3. Single unit-mechanism is easily removed for inspection or cleaning in field.

ENGINE SPEED INDICATORS



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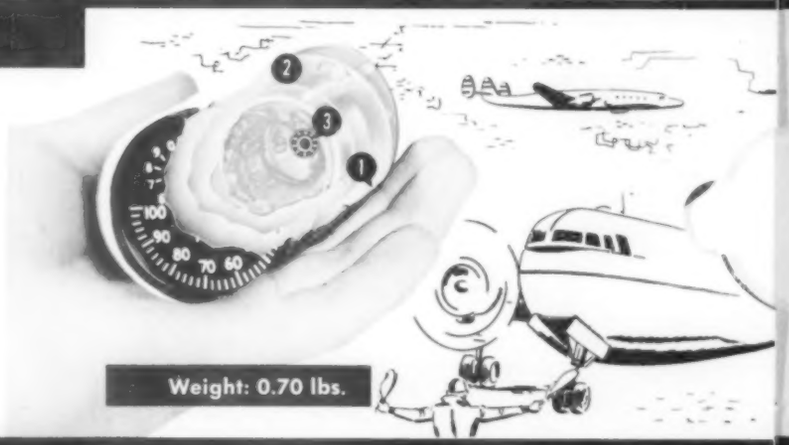
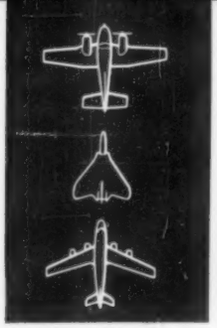


READS EASILY

1. G-E instruments are hermetically sealed to give protection in all weather conditions.
2. Improved temperature compensation and dependability. Gives high accuracy.
3. Low-friction indicator bearings assure prompt starting under rugged conditions.

POSITION INDICATORS



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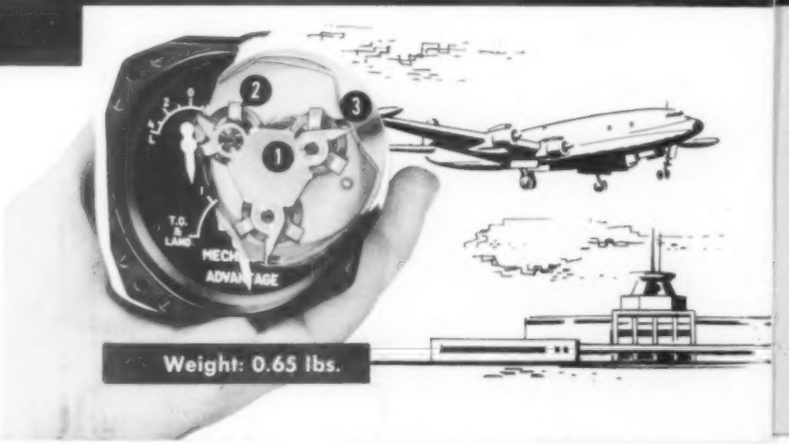

STURDILY BUILT

1. Patented G-E d-c unit has greater dependability for accuracy in position readings.
2. Simplicity of G-E element construction means lighter weight and greater strength.
3. Complete shielding eliminates magnetic effects and protects instrument accuracy.

Progress Is Our Most Important Product

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Specify General Electric Aircraft Instruments Today For Accurate Measurement of Tomorrow's Performance

By specifying General Electric aircraft instruments during the design stages of planning, you are assured of a high quality, dependable instrument performance in the finished aircraft. G-E aircraft instruments are developed through careful research, analysis, and testing to fulfill and surpass the most rigid requirements of the planes in production today and in planning for the future. Pictured above as they are being incorporated at the design stage are:

1. G-E liquid-level indicator and transmitter.
2. G-E stainless steel exhaust gas thermocouple harness.
3. G-E mass fuel flowmeter, consisting of transmitter, indicator and power supply.
4. G-E thin-wing, earth-inductrol compass transmitter.
5. G-E compass system consisting of a low-drift gyro, amplifier and controller.
6. G-E servo temperature system comprised of indicator and amplifier.

For further details, write General Electric, Section 586-1, Schenectady, N. Y.

GENERAL ELECTRIC

AVIATION CALENDAR

June 16-18—American Society of Mechanical Engineers, 19th National Applied Mechanics Conference, including sessions on aeronautical and guided missile research, Rensselaer Polytechnic Institute, Troy, N. Y.

June 17-24—Federation Aeronautique Internationale, 50th Anniversary Conference, Paris.

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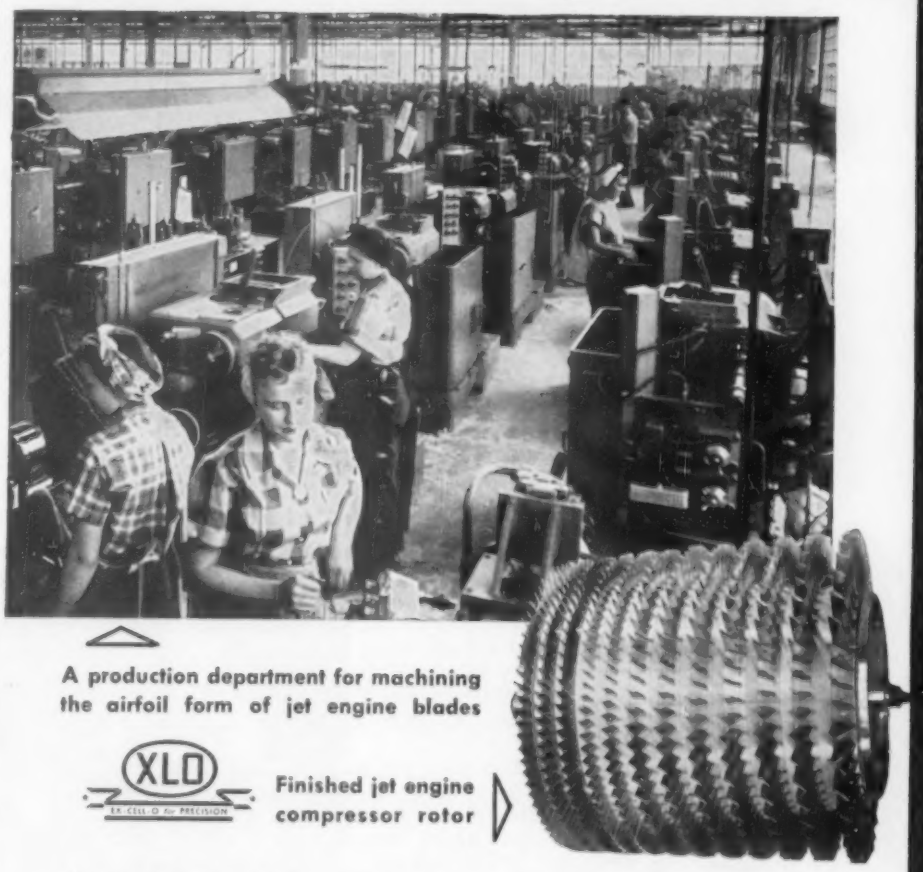
AIRCRAFT ENGINE BUILDERS LOOK TO

EX-CELL-O

For Volume Machining of Jet Blades



A production department for machining the airfoil form of jet engine blades

XLO EX-CELL-O for PRECISION

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A complete line of automatic blade finishing machines, designed and perfected at Ex-Cell-O, turns out large volumes of jet blades to the specifications of engine builders. In addition, Ex-Cell-O, through its subsidiary, Robbins Engineering Company, machines rotor wheels, inserts the blades, and assembles the complete rotors.

Plant facilities have been expanded and added employees have been trained in the machining and inspection of these precision parts and assemblies.

As one of the world's largest producers of precision parts for aircraft engines, Ex-Cell-O can help you eliminate bottlenecks and meet production schedules. For information or a quotation on your precision parts, contact Ex-Cell-O in Detroit.

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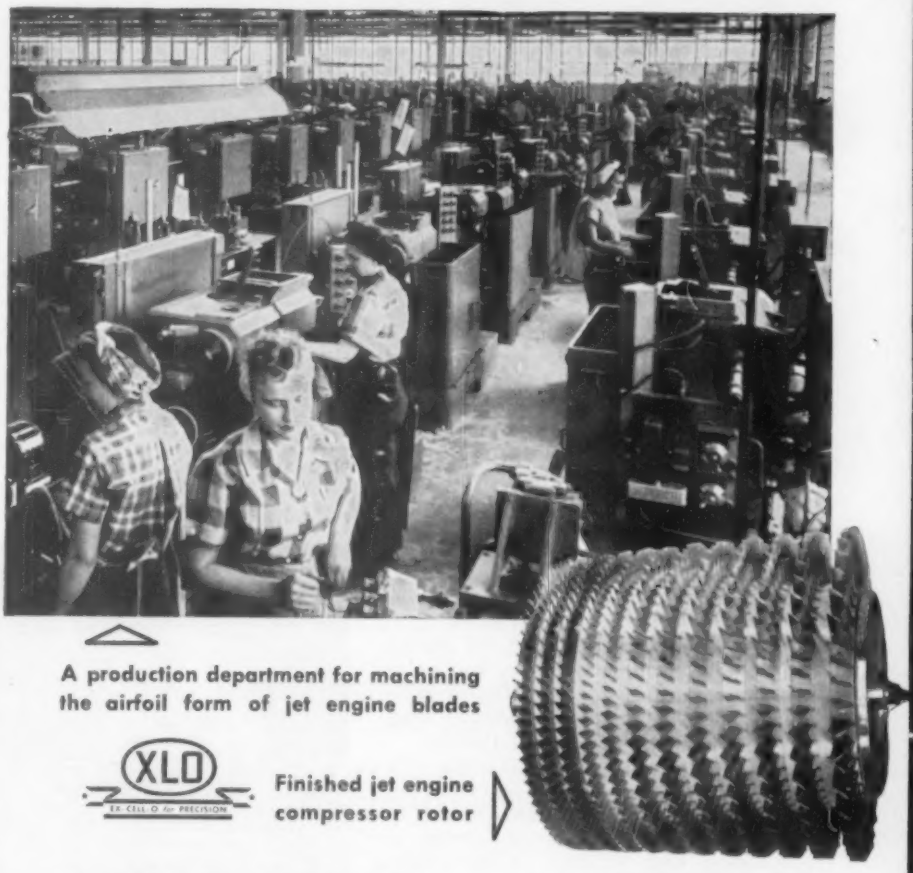

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North Atlantic Operators to Test Airborne Teleprinter This Fall

By Philip J. Klass

Automatic teletype transmission of weather and other general advisory information to airliner crews is slated for trial evaluation this fall. The program is sponsored by Nartel, an informal organization of North Atlantic airline operators originally formed to implement radio telephone communications on North Atlantic Routes.

Five airlines flying the North Atlantic agreed to give the equipment a test, during the annual meeting of International Air Transport Assn.'s technical conference in San Juan last month. Subject to availability of equipment, Trans-Canada Air Lines, Trans World Airlines, Pan American World Airways, British Overseas Airways Corp. and Scandinavian Airlines System each plan to install an airborne teleprinter in at least one plane for the fall evaluation.

Several manufacturers have indicated their intention of having equipment ready by the end of the year.

By the addition of an airborne teleprinter, Nartel expects to relieve overcrowded radio-telephone channels and to free the flight crew from monitoring long broadcasts merely to pick out the specific weather or advisory information of interest.

At the moment, Nartel is promoting the airborne teleprinter for its own operators. However, like Selcal, the selective calling system developed by Pan American Airways for its international operations, the airborne teleprinter may eventually find use on domestic airliners.

The Need

In the days when international carriers had radio operators aboard he copied large volumes of information from which the flight crew abstracted material of interest to them, according to Hal Ferris, technical assistant to the director of telecommunications for Trans-Canada Air Lines. Narrow-band "wireless telegraphy" was used to provide such service.

Today such information is transmitted by voice communication directly to the flight crews, forcing them to monitor much unwanted information and cluttering up crowded communication channels.

What is needed, Nartel believes, is a teletype broadcast service which would be received and printed out by an airborne receiver and teleprinter. The flight crew could then glance over the printed information, extracting what they need.

TCA's B. G. Doutre has completed a study of the problem which indicates that two moderate power ground stations, one on each side of the Atlantic, could provide the required service. One station is being set up at Halifax, the other in the United Kingdom.

Characteristics of the ground keyers: 100-150 kc. band, with 40-cycle frequency shift; standard 5-unit start-stop coding at 60 words per minute.

Specifications

Nartel has released the following general requirements for its ground-to-air radio teleprinter:

• **Weight.** Both the airborne receiver and associated teleprinter must be lightweight and reliable. Both should be designed for operation from 28-v. d.c., or 115-v. 400 cps single-phase power.

• **Coding.** Airborne system should be designed to operate from standard TWX code now employed by ground stations for point-to-point teletype transmission. However, teleprinter should have sufficient design flexibility to accomodate more sophisticated coding if adopted at a later date.

• **Static sensitivity.** Airborne receiver should be designed to "ignore" short duration, high-amplitude "spikes" of noise generated by local thunderstorms and precipitation static. Receiver should be designed to operate from a short vertical antenna or omnidirectional loop system.

Doutre has talked to manufacturers in the U. S. and Europe who might be interested in developing suitable equipment. He reported at San Juan that several intend to have sets available by year's end. The trial installations this fall will help to evaluate existing equipments and establish operating requirements. Until this evaluation is complete, Nartel operators will make no plans for possible fleetwide installation.

Avionics manufacturers interested in obtaining more information on the Nartel radio teleprinter broadcast program may contact B. G. Doutre, Telecommunications Dept., Trans-Canada Air Lines, Dorval, Quebec.

Batteries for Missiles

Small silver-zinc storage batteries for missiles are being mass-produced by Yardney Electric Corp., New York. Measuring only 3.43x2.79x4.78 in., these Silvercel units have nominal capacity of approximately 100 amp.-hr. and peak pulse discharge of 2,000 amp., about equal to the firm's larger Silvercel used for starting jet aircraft.

New Speed Transducer Gives Rate of Climb

A vertical speed transducer with a very fast rate of response—time constant is 2 sec. at 50,000 ft. and 0.2 sec. at sea level—is being produced by Trans-Sonics, Inc., for highspeed jets.

Standard rate-of-climb indicators have a very slow rate of response at high altitude, according to Trans-Sonics, the time constant often exceeding 20 sec. at 50,000 ft.

The transducer can be used in applications other than rate-of-climb indication. Because of its high rate of response, the instrument's electrical output can provide a signal with sufficient lead to suppress any "porpoising" tendency a jet might encounter during high altitude flight by automatically stabilizing altitude servos in the plane's flight control system. It may also be used for manual level flight control and to supply telemetered data.

The instrument uses a Trans-Sonic device called an Equibar to measure pressure differential between pressure in the plane's static line and a cavity connected to the static line by a small capillary.

Difference in these pressures is proportional to vertical speed and the instrument is designed to provide an electrical signal proportional to the rate of ascent or descent of the airplane.

Address: Bedford Airport, Bedford, Mass.

Into jet training—safe, slow-speed landings

Cessna T-37... Designed for Jet Training

Everytime the T-37 returns from a test flight in Wichita it is apparent that jet training is being made easier, safer. The reason: the new jet trainer has a slow landing speed, makes the move into jets relatively simple.

The shift from prop driven to turbojet airplanes is a big step, imposes stiff requirements on the men who train to fly with the USAF. To meet these, the Air Force designated CESSNA responsible for building an aircraft which would readily fit into the pilot training program. This, the T-37 is designed to do. Naturally, this means real savings in time and money.

* * *

Here at CESSNA, we are proud to be a part of the Air Force's jet age planning.

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Be an Aviation Cadet.
Inquire today at your Air Force Recruiting Office about the future your Air Force offers you.

WICHITA, KANSAS

ONE INTEGRATED UNIT—no associated amplifiers and compensators needed because of the small variation in transformer ratio and phase shift with varying input voltage.

EXCEPTIONAL ACCURACY: ± 2 min. null spacing, ±3 min. interaxis error, 0.05% max. amplitude error.

COMPACT—weighs only 5.87 oz.

- 0-16V 400 CPS input voltage range. Special units may be designed for higher input voltages.
- 740/79° input impedance.
- Available with 1 and/or 2 input or output windings.
- Transformation ratio: (S/P) .955 ± .015.
- Phase shift: 4°30′ ± 30′.
- Max. static torque (oz.in.²): .5.

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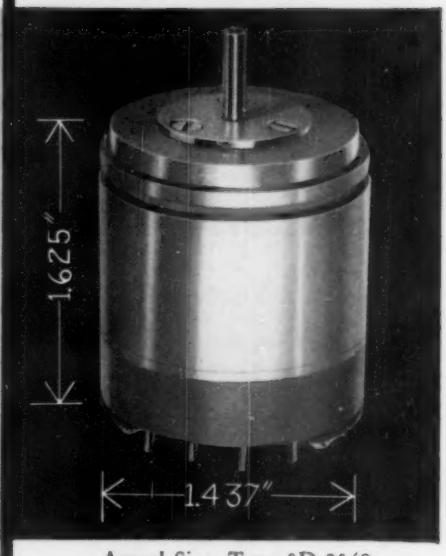
precision resolver



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LETTERS

Aviation Week welcomes the opinions of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Australian Viscounts

Knowing that you are always anxious to ensure that facts appearing in Aviation Week are correct, I think it is right that I should state on behalf of both Vickers-Armstrongs Ltd. and Trans-Australia Airlines that, contrary to the suggestions contained in your article ("Australian Airlines Want More DC-6Bs," May 13, p. 116), all Viscount operations in Australia are proving highly successful.

This statement is borne out by official statistics, by Australian press reports and is confirmed by the fact that TAA have just ordered a further three aircraft, something they would hardly have done if, as your correspondent suggested, their Viscount operations had resulted in increased operating expenses.

Furthermore, I can state that Viscounts have never up to this time had to refuel on the Perth/Adelaide route, and they are regularly beating the DC-6B times on this route by 20 minutes or so. In fact, within the last few days they have captured the Perth/Adelaide record with a flying time of 3 hours and 57 minutes for the 1,415 mile trip.

Trans-Australia Airlines are currently using four Viscounts—with one reserve—at a total daily fleet utilization of over 47 hours. Their average passenger load factor since the Viscount services began is 84.3 with a total of nearly 64,000 passengers carried. All their operations have shown a clear passenger preference for the Viscount.

CHRISTOPHER CLARKSON
United States Representative
Vickers-Armstrongs, Ltd.
10 Rockefeller Plaza
New York 20, N. Y.

Plan for Progress

Your issue of May 23 should be of concern to all Americans. Available information in Soviet missile progress is equally frightening.

It is now evident that we should move our thoughts from the political level and consider matters from the standpoint of survival. Some salient objectives in our technology should be to:

- Increase our research effort. The present great time lag between conception and fruition is much too large for comfort. We are not devoting enough effort to promote new developments nor are enough competent people available to assess them.
- Increase our engineering efforts. Our engineer shortage is a myth. Better incentives for our technical personnel are needed.
- Make our systems concepts more flexible. Provisions must be allowed for advances in the state of the art.
- Allow for increased use of independent specialists in the field. Creative individuals are needed to advance fresh concepts unfettered by present closed corporation thinking.
- Bring experienced technical experts into our intelligence picture. These experts are needed at the primary data gathering level —not only at or near the top.

America has had the fortune to be blessed with a free atmosphere and a generous supply of tools and resources. We must utilize this environment to its fullest in the present technological struggle.

ALFRED J. ZAEHRINGER, President
American Rocket Co.
Box 1112
Wyandotte, Mich.

Voodoo Performance

SURPRISED YOU OMIT F-101 IN YOUR PRODUCTION BOX SCORE, PAGE 14 (MAY 23). USUALLY WELL-INFORMED TIME MAGAZINE CALLED THIS A MACH ONE-POINT FIVE SHIP. IT'S IN PRODUCTION. INFORMED CIRCLES SAY IT'S ALSO THE LONGEST RANGE U.S. FIGHTER THAT IS IN PRODUCTION. WE HAVE ALREADY OFFICIALLY ANNOUNCED THAT VOODOO IS U.S. MOST POWERFUL FIGHTER.

BOB WOOD
McDONNELL AIRCRAFT CORP.
ST. LOUIS, MO.

Pro Slopeline Lights

I see that Mr. Calvert has appeared in the lists against the slopeline approach lights (letter, "More on Approaches," AW Apr. 11, p. 95). This should add materially to the intelligence of the opposition, as Mr. Calvert is an expert and well-known authority on aviation lighting, and he has published many lengthy papers and reports on various phases of the problem.

Mr. Calvert, apparently, is not free from an evident and marked bias on approach light patterns. He himself has developed a pattern which is a modification of the centerline, with a series of horizontal crossbars. He is also somewhat less than frank in stating that no accidents have occurred on approaches on centerline patterns with crossbars.

It was reported that several crashes occurred on approaches on this pattern at Berlin during the Airlift, and at Newark a very embarrassing test approach on the full ALPA centerline pattern, complete with condenser-discharge fancy frills, plowed up the marsh mire a couple of hundred feet to the left of the approach on Oct. 16, 1951.

Mr. Calvert did pay several visits to the Landing Aids Experiment Station and stood behind the pilots on test approaches as I did. He would have derived more benefit from his visits if he had discussed the operations with these test pilots, and if his mind had been open enough to accept and profit from their experience.

He has wasted a great deal of verbiage in arguing and trying to prove that the slopeline lights cannot possibly do what these pilots found that they did do—give the pilots accurate and usable guidance under the worst weather conditions.

► **Pilot Skills**—Mr. Calvert discounts the evidence of these test pilots on account of their skill and experience in flying in fog. They developed that skill and learned how to interpret the slope lines by flying in fog and by using them. Any pilot can do so, and many have.

It has been my opinion that pilots in general, and especially transport pilots, all have to be skilled. The entire operation of flying is artificial and unnatural, and a pilot has to be trained for every phase of his work. Why, then, should there be objection to his having to learn how to interpret the accurate information given him by an artificial pattern like the slopeline?

One point dug up and used as a criticism of the slopeline is what Mr. Calvert describes as the "downhill effect." By that he means that if a pilot sees the lines formed by the slopeline units and mistakes them for parallel lines, he will get a mistaken idea of his height.

If we assume such conditions and ignore the crossbars forming part of the slopeline pattern, the pilot would underestimate his height and would tend to correct by pulling up a little—a safe maneuver—until the breakup of the lines showed him the true conditions.

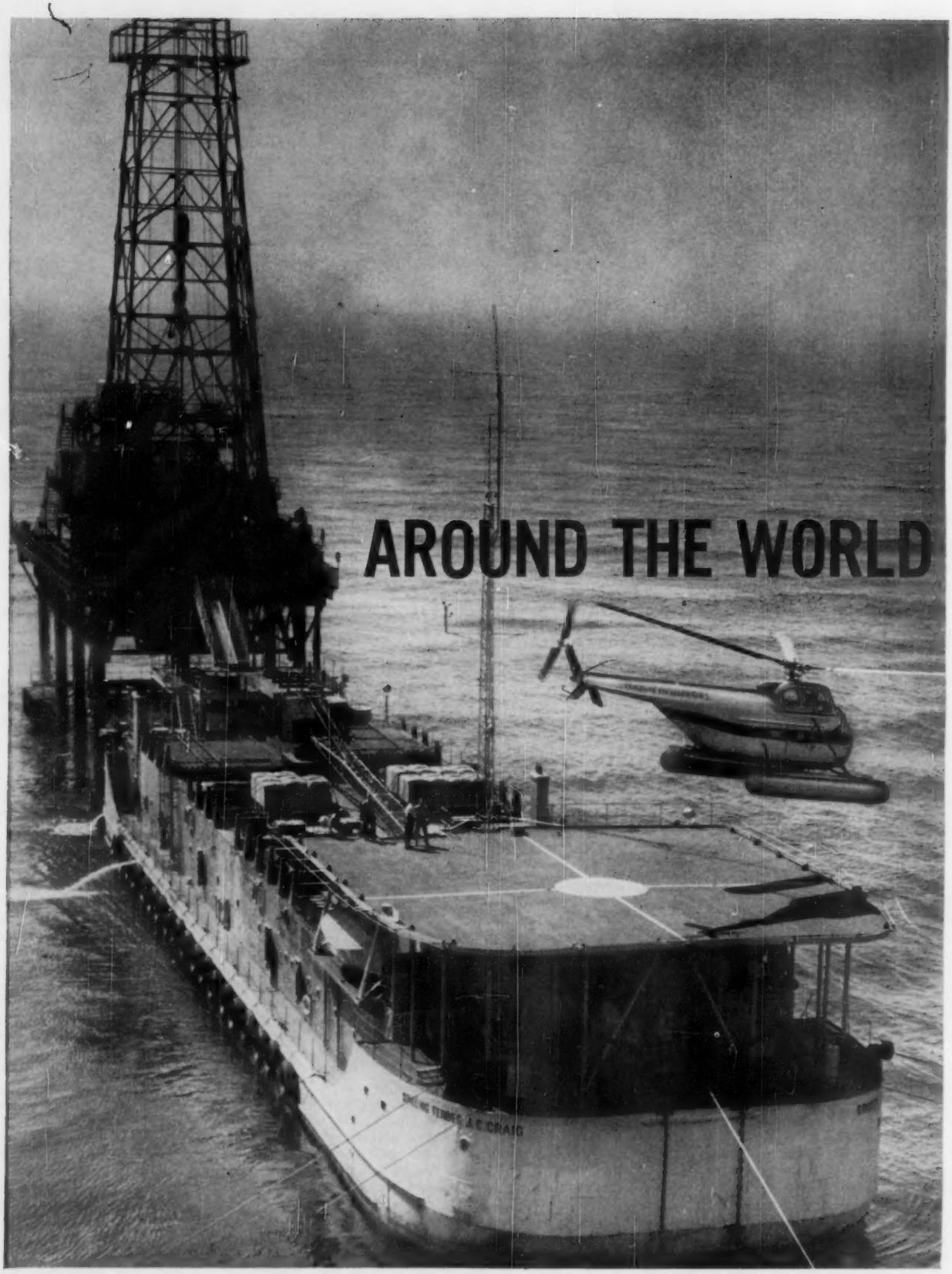
► **Effect of Cut-Off**—Mr. Calvert made one very illuminating statement. He stated that safe landings cannot be made under visual guidance from approach lights if the visibility is under 500 yards.

If he restricts his statement to apply to centerline approach lights, I will agree with him. The nose of the airplane does block out all of the centerline for several hundred feet ahead of the airplane, and the pilot is dependent for visual guidance on what he can see beyond this cutoff and up to the point where the fog cuts off the more remote lights.

As long as approaches are made with not less than 1,500 feet visibility and a clear ceiling under the overcast, the centerline is perfectly satisfactory and even the froth of the flashing lights can serve to correct loose or sloppy navigation. The slopeline uses units more effectively placed, where they are much less affected by cut-off, and employs lights between rows only for crossbars for distance marking and horizontal reference.

The Landing Aid Experiment Station reported adequate guidance and successful landings on the slopelines with as little as 500 feet of bars visible.

The only trouble with the slopeline approach lights is that most pilots have not learned to use them. If they had been installed, complete with the recommended crossbars, on all instrument approaches, all pilots could have learned to interpret them,



GULF COAST—Specially designed float-type landing gear, pictured here, is now available for commercial Sikorsky S-55 helicopters regularly used to fly men and equipment between the mainland and oil well drilling rigs offshore. It weighs about the same as the wheel-type gear it replaces, which means S-55s so equipped can carry their normal large loads. These S-55s can land on water or marshes, on regular heliports, or on platforms at sea.

SOUTH AMERICA—Maps needed for civil development in South America will result from an Inter-American Geodetic Survey to be undertaken soon. Five U. S. Army Sikorsky H-19 helicopters will be used on the project. The big red and white Sikorskys will work in ten South American countries. Similar surveys in Alaska are planned.

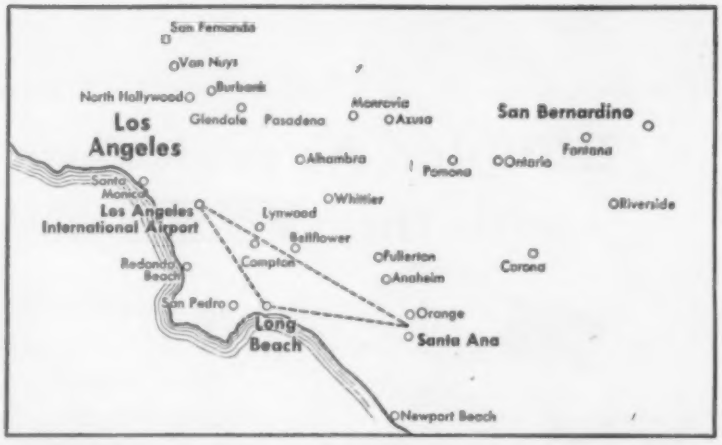
SWEDEN—In Stockholm, air experts from Finland watch Ostermans Aero, Ltd., a pioneer commercial helicopter operator, demonstrate rescue techniques with a big Sikorsky S-55 helicopter. Ostermans plans to begin helicopter passenger service soon between Malmo, Sweden, and Copenhagen, Denmark.

WITH SIKORSKY HELICOPTERS

HELICOPTER HISTORY:

Flotation Gear Pioneered by Sikorsky's VS-300

EARLIEST USE of flotation gear on helicopters was on Sikorsky's historic VS-300, the first successful American helicopter. This picture made at Stratford, Connecticut on April 17, 1941, shows Igor Sikorsky at the controls of the VS-300. It had three rubber floats. Later versions used two long floats, similar to those on today's S-55s.



CALIFORNIA—Los Angeles Airways' passenger service with Sikorsky S-55 helicopters now has been extended deeper into Southern California. A new route connects Santa Ana and Orange with Long Beach and the Los Angeles International Airport. Passenger service as far east as San Bernardino is planned by early summer, and to more than a score of other cities around Los Angeles (see map) by the year's end.

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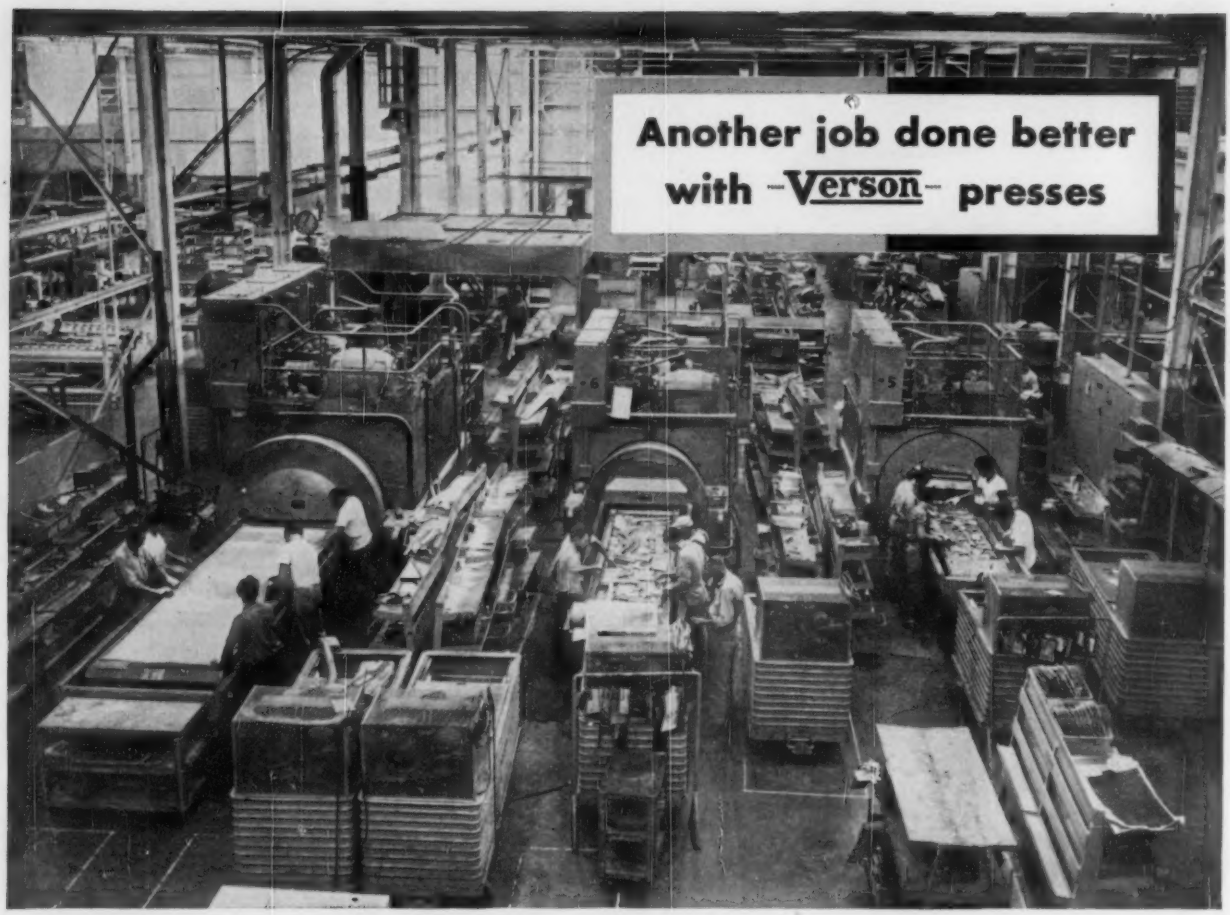

Douglas Aircraft Cuts Forming Costs with this Verson-*Wheelon* Line-up

Specifications, operating data and illustrations of typical jobs are given in the Verson-Wheelon Bulletin. Write for your copy, today.

At the Torrance Facility of the El Segundo Division of Douglas Aircraft Company, these Verson-Wheelon direct acting hydraulic presses are handling rubber pad forming jobs at a fraction of the cost of conventional methods. A 21,000 ton and two 18,000 ton presses are not only doing the job more economically, but are doing it better.

The Verson-Wheelon Press is lower in first cost than a conventional rubber pad press and is more efficient in operation. Installation and operation are simpler and for most jobs forming is completed in the press, eliminating hand finishing. If you do rubber pad forming or short run forming it will pay you to investigate a Verson-Wheelon Press. For recommendations, send an outline of your requirements.

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and we would not be hearing of pilots making only one or two approaches a year under reduced limits.

▶ **'Garden-Party Approaches'**—As long as aviation is restricted to existing visibility limits, centerline approach lights, with or without the extravagantly expensive condenser-discharge lights, will serve for the garden party approaches.

How long will these limits be tolerated? No lower limits can be justified with the centerline approach lights, even by their most ardent supporters. If aviation is going to progress, and if all-weather operation is to be achieved, something better is needed.

Slopeline approach lights have been proved a workhorse for the tough going, and all of the prejudiced opinion and learned arguments cannot gainsay that fact.

H. J. Cory Pearson
6165-A Carvel
Indianapolis, Ind.

Too Many Engineers?

As a reader of Aviation Week and its predecessors for the past 30 years, I agree with the letter of William H. Moesel (AW Mar. 7, p. 37) relative to the engineer shortage. My letter to you was prompted by your current article ("Scientist Shortage Threatens Defense," AW Mar. 21, p. 31).

In some respects this article is quite true but most stories of this kind tend to ignore the basic fact that Mr. Moesel stated in his letter, i.e. that the supervision of aviation engineering organizations is at fault in many instances.

▶ **Too Many Engineers?**—I feel, and still feel, that the problem is not insufficient engineers, but too **MANY**! This is not an idle statement to be sensational. It is based on a contact with and employment in the aviation business for more than 12 years. During that time, at least 50% of my working time was wasted by poor decisions by my superiors!

The writer always worked in a supervisorial capacity. Only 50% of the available working time was usable. Of the remaining, 25% was expended in the line of personnel relations, idiotic reports, forms, and what not.

Much of the engineering time is wasted on a lot of ambiguous reports that while good to have, actually have little to do with the production or design of aircraft. If the average engineering firm had as much paper work that was actually superfluous to the job at hand, they would go bankrupt in private business.

The military are also at fault in this respect that they have yet to devise an incentive plan to any company to design fighting planes other than on a boondoggling time and material basis. Another angle is that indecision as to what is required is also the contributing cause of needing thousands of engineers to do a nominal job.

▶ **They Were Expendable**—The writer knows among his personal acquaintances about a dozen competent former engineers, some with degrees and some without. They all left the aviation engineering field due to causes such as personal petty politics that run rife in any large engineering office

The **HOSTESS CALL LIGHT SWITCH "GOES TO TOWN"**

Frequently, where indicator lights must be used in conjunction with switches, modern aircraft design affects a worthwhile weight and panel space saving by using Hetherington switches with *built-in* lights. Developed originally by Hetherington as hostess call lights, these compact little units are now available for a broad range of exacting commercial or military aircraft services. Write for catalog.

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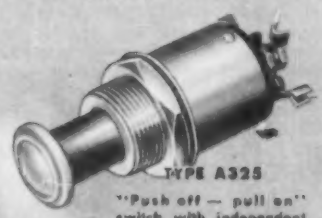
TYPE A304
Push-button momentary-contact switch-indicator light combination.

TYPE A8500
"Push off—pull on" or Type A13800 "push on—pull off" snap switch with built-in "on-off" light.

TYPE A311
"Push on, pull off" switch also operates "on-off" independent lamp circuit. "Pull on, push off" Type A312 also available.

TYPE A314
Push-button normally-open momentary-contact switch plus independent, unbroken lamp circuit. Type A315 (not shown) has normally-closed contacts.



TYPE A325
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but more so in the aviation engineering office than others.

They also left because management felt that engineers are an expendable item regardless of the cry now for good engineers. Many men, not college graduates, but good technicians nevertheless, left the industry to seek other more lucrative fields due to poor management of the engineering departments.

The biggest complaint during the war in the engineering departments was the lack of work and not the amount of overwork.

▶ **Management Personnel**—From what I could gather, much of the shortage of engineers is not the need for graduate engineers as much as the need for graduate management personnel.

Much time is wasted by dreamers who pride themselves on how many acres of engineers are required to build a fighter plane. Instead of bragging that it takes 8 million man-hours to design an airplane, they should hide their head in shame.

Definitely, there are sufficient engineers to meet requirements. But there are not sufficient engineering managers to employ the manpower efficiently that is available. As a result, much of the work is wasted and the time not recovered.

▶ **Laugh at Aviation**—The aviation industry could recover much pay dirt in the men and the manpower that left the industry in disgust at the end of the war if they corrected some of the existing practices.

If you go to any engineering concern and they ask your past experience, and you tell them aviation, they discount your ability because they feel you have been subjected to spoon-fed antiquated practices compared to commercial engineering requirements. In short, they laugh at you.

What Mr. Moesel said is right and it applies to this reader. If they changed management practices and upgraded the engineer not only in his salary, but his judgment and ability, then I am certain the shortage would not be chronic! How long will it take management to learn that simple truth?

Willis L. Nye
3038 Bridge St.
Hayward, Calif.

WADC Job Offers

In the past, your magazine has afforded valuable assistance in establishing contact with qualified personnel to fill vacancies at this center.

Often the urgent need for such highly trained personnel exceeds those available on Civil Service registers. Since paid publicity or advertising for recruitment purposes is prohibited by Civil Service regulations, a paid advertising service cannot be utilized. Consequently, in many instances, mention in your publication of these existing vacancies, has been of great aid in alleviating this situation and ultimately helping the Air Force fulfill its mission.

The following is a list of positions which are presently vacant. Starting salaries range from $4035 to $7040 per annum.

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- Aeronautical Research Engineer, GS-12, $7040.
- Aircraft Flutter and Vibration Engineer, GS-12, $7040.
- Aeronautical Development Engineer, GS-11, $5940.
- Aeronautical Engineer (Parachute Development), GS-11, $5940.
- Aeronautical Power Plant Research Engineer, GS-11, $5940.
- Aircraft Flutter and Vibration Engineer, GS-11, $5940.
- Aircraft Modification Design Engineer, GS-11, $5940.
- Aircraft Performance Engineer, GS-9, $5060 & GS-11, $5940.
- Aircraft Preliminary Design Engineer, GS-11, $5940.
- Aircraft Structural Loads Engineer, GS-11, $5940.
- Aircraft Structural Development Engineer, GS-11, $5940.
- Aircraft Flutter and Vibration Engineer, GS-9, $5060.
- Aeronautical Engineer (Parachute Development), GS-9, $5060.
- Aeronautical Power Plant Fuel and Lubrication Engineer, GS-9, $5060.
- Flight Test Engineer, GS-9, $5060.
- Aeronautical Engineer, GS-7, $4580.
- Aeronautical Engineer, GS-5, $4035.

Any assistance you may render by publicizing these vacancies in your professional publication will be sincerely appreciated.

R. A. Morrissey
Chief, Professional & Scientific Placement Section
Civilian Personnel Division
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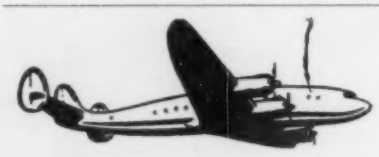

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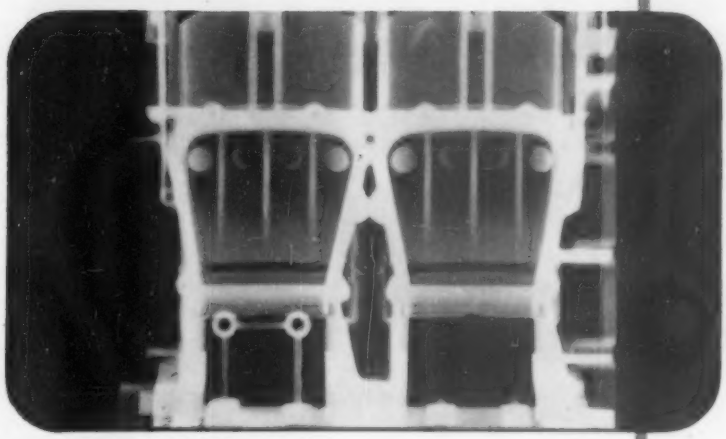
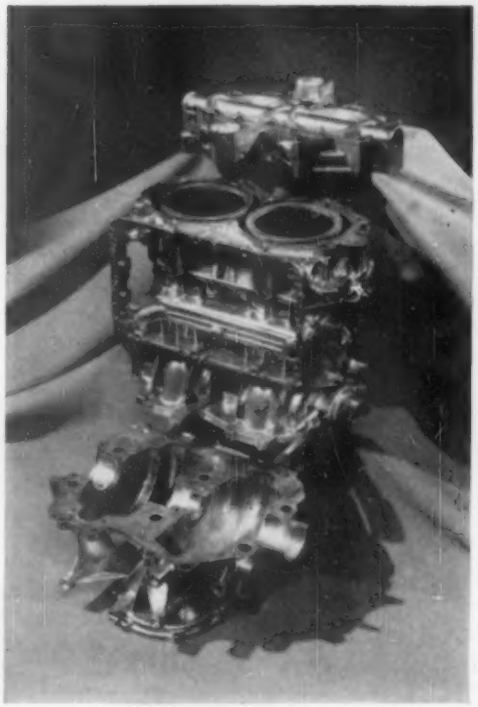


RADIOGRAPHY keeps its eye on production



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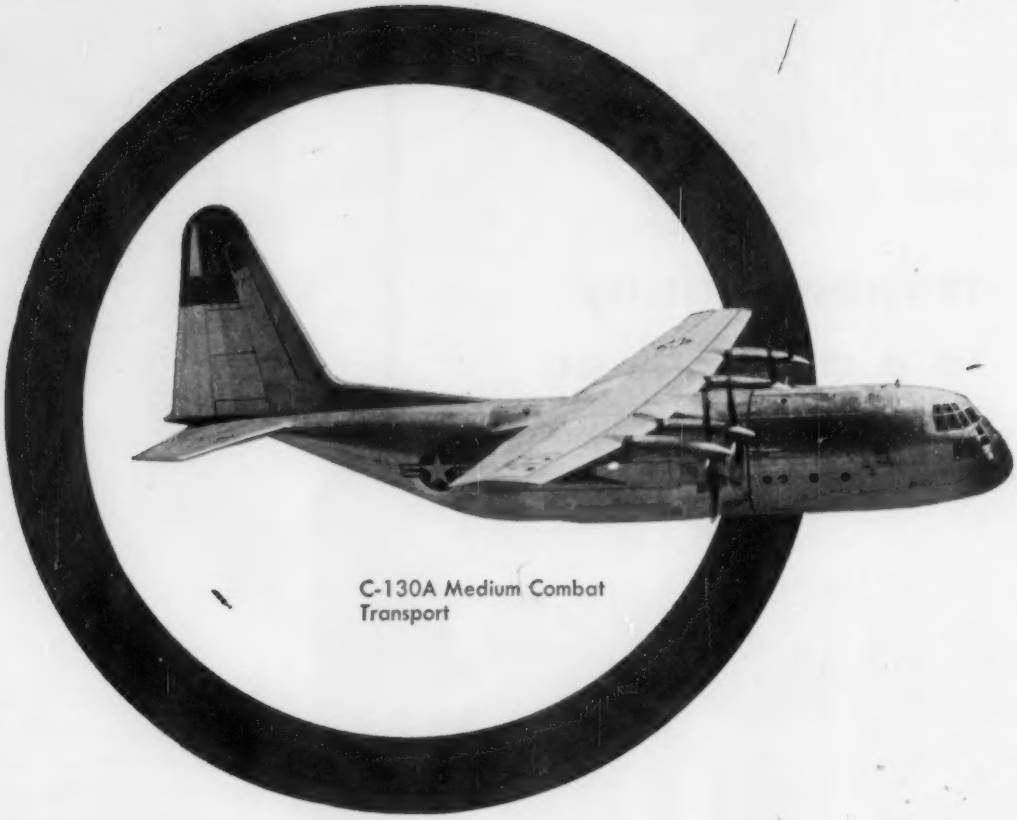

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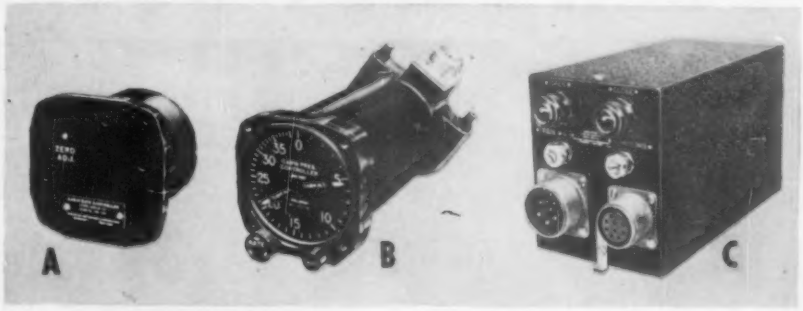
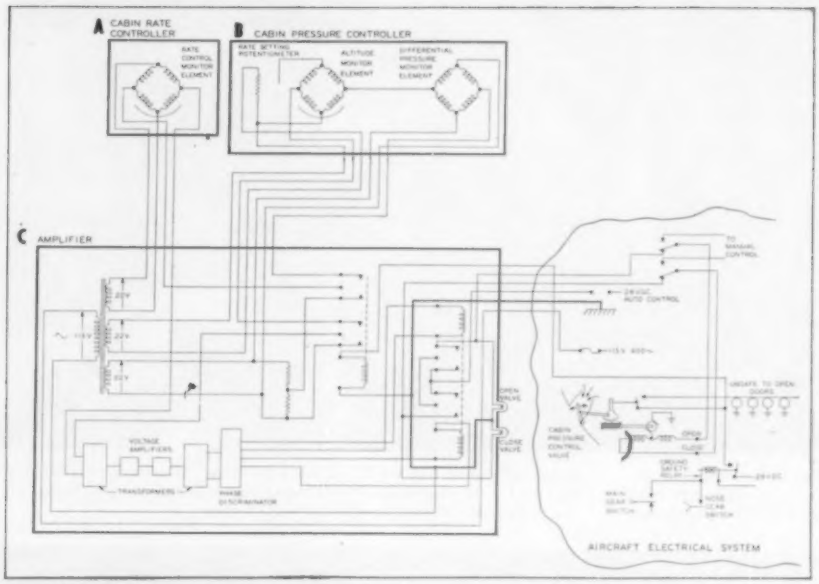




CABIN PRESSURE CONTROL SYSTEM. As used in Douglas DC-7C, amplifier will be slightly different than shown here; light bulbs will be inserted only during test of equipment.

Kollsman Reveals Developments In New Instruments, Controls

By George L. Christian

Airline instruments should be tailored to airline needs.

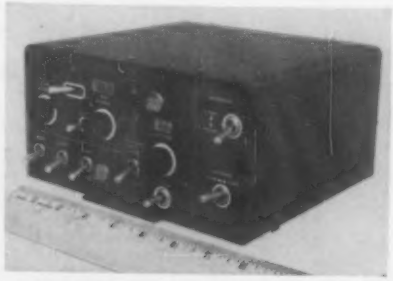
Pilot presentations should be combined and presented visually in a form that is easy to grasp and not subject to misinterpretation.

These two philosophies are guiding much of the work now being done by Kollsman Instrument Corp., Elmhurst, N. Y.

First example of the airline effort is an all-electric cabin pressure control system which will be standard equipment on the Douglas DC-7C. Components are standard, precision Kollsman products which are well-established through wide use in other applications.

The trend toward visual instrument presentations is becoming increasingly important for today's supersonic pilots. They must have clearly intelligible instruments in front of them which can be read at a glance.

Example of this trend is the Kollsman counter altimeter (AW Apr. 25, p. 72) which uses a two-digit counter indicator to show altitudes in the thousand and ten thousand foot range. A single needle indicates ten and hundred foot altitudes in 50-ft. increments. Company officials feel that this presentation can be read much faster than the three-pointer type widely used today.



PHOTOELECTRIC sextant remote indicator.

Another instrument still under development and aimed at turboprop and turbojet powered aircraft is a computer which will combine and correct flight information and present to the pilot data which requires no further calculation.

Cabin Pressure Control

Here are first details of the new, all-electric cabin pressure control system which, Kollsman engineers say, will be used on the Douglas Seven Seas and is also replacing current pressure control systems in some DC-6s.

Heart is a basically simple, rugged, diaphragm-operated pressure monitor of which Kollsman has manufactured thousands for many uses. So the airlines will benefit from the company's long-accumulated experience with the unit.

As the system is all-electric and diaphragm-operated, no cabin air flows through the sensing mechanism. This keeps air-entrained impurities from being deposited on the system's working parts and impairing their operation, as happens in some existing systems.

Three pressure monitors sense the airplane's altitude, cabin rate-of-climb and differential pressure between cabin and ambient.

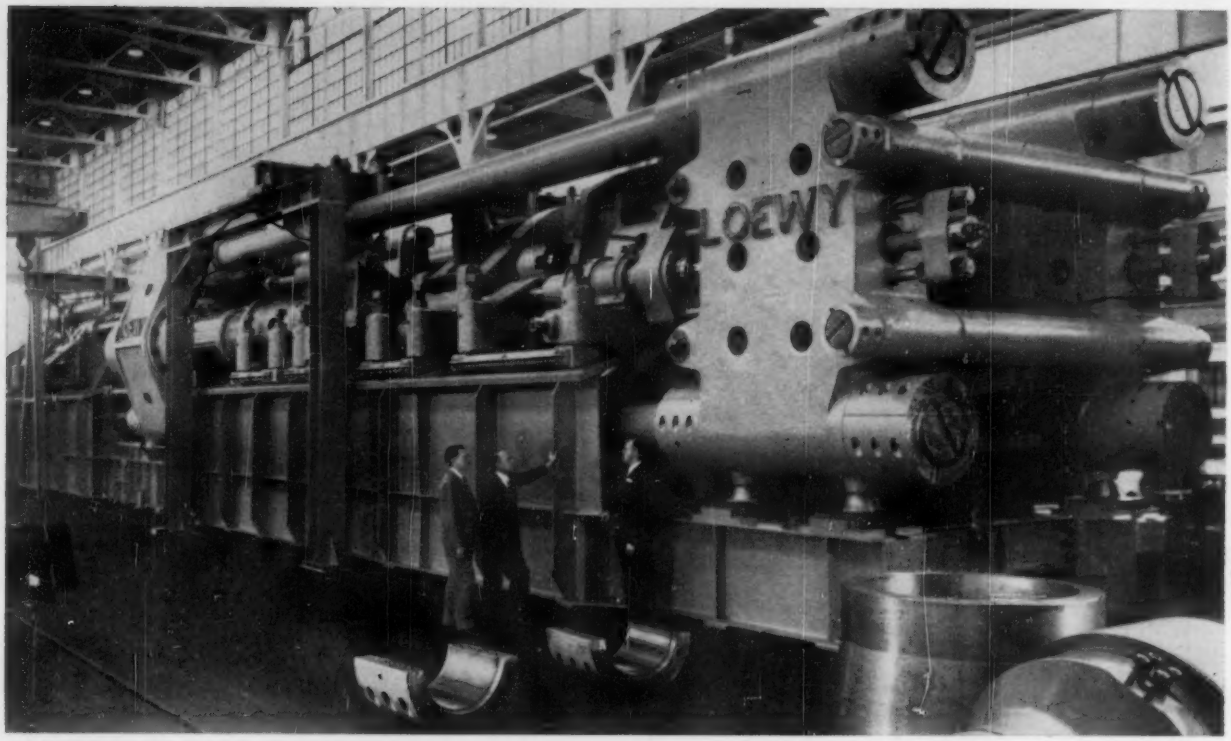
Electrical output of the first two pressure monitors is fed into an amplifier (pre-amplifier is transistorized) where their respective phasing is discriminated, amplified and fed to a cabin pressure control valve. Signals from the third (differential) pressure monitor are also sent to the amplifier. Its output is strong enough to override altitude monitor signals, allowing it to position the cabin pressure control valve to prevent cabin pressure from exceeding a predetermined value.

System operation is simple. A cabin pressure controller, which resembles a standard altimeter, is mounted in the cockpit, accessible to a crew member. Dial is calibrated in feet of pressure altitude from zero to 40,000 ft. There are two interconnected pointers, one for flight altitude, the other for cabin altitude.

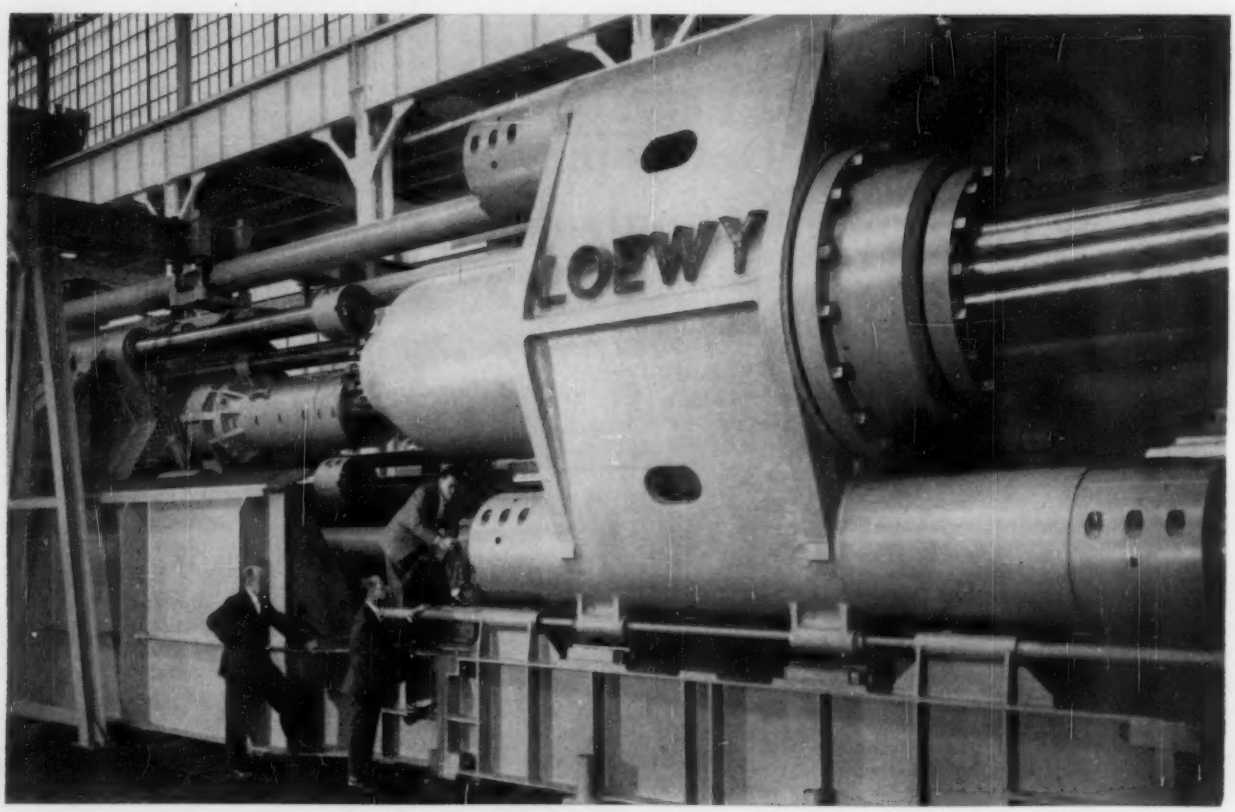
On the instrument are two manual knobs; one is set to maximum altitude desired, other to cabin rate. All other operation is automatic.

Cabin rate is usually held at 300 feet per minute or less. Kollsman spokesmen say the system's degree of control sensitivity is something new to

FIRST KAISER ALUMINUM



Photographs (above and below) of one of the two new 8,000 ton presses, built by Loewy. Each press has two main cylinders with a total of 5,400 tons and 1 piercer cylinder of 2,700 tons. Maximum billet size will be 20″ O.D. x 56″ long. Maximum circle size will be 17″ in diameter. Maximum weight per piece will be 1,200 lbs. Maximum finish length will be 85 feet.



8,000 TON PRESS

starts production of extrusions in September!

Second 8,000 ton heavy extrusion press soon to be operating at Kaiser Aluminum's Halethorpe, Maryland plant

THE FIRST of Kaiser Aluminum's two 8,000 ton heavy extrusion presses at Halethorpe will start operation in September—producing longer and wider extrusions up to 17" in cross section.

These new heavy extrusion presses—built in conjunction with the Air Force Heavy Press Program—are an important addition to Kaiser Aluminum's existing extrusion facilities.

The new Halethorpe heavy extrusion plant is completely equipped and fully integrated for the production of heavy extrusions exclusively. It contains the most modern heat-treating and finishing equipment, die shop and laboratory.

Included are both vertical and horizontal heat treating furnaces, a 1,500,000 pound stretcher, modern handling equipment for large extrusions, and shipping and inspection facilities.

In addition, the plant contains a modern remelting and casting department, homogenization furnaces, aging and annealing ovens, and induction billet heaters.

The second of the two giant presses will insure air frame manufacturers against delays and disrupted schedules due to temporary equipment shutdowns.

Major advantages to aircraft and other industries

The large extrusions to be produced by Kaiser Aluminum's two 8,000 ton presses offer potentially huge savings in both money and man-hours to the aircraft, transportation, electrical and other industries.

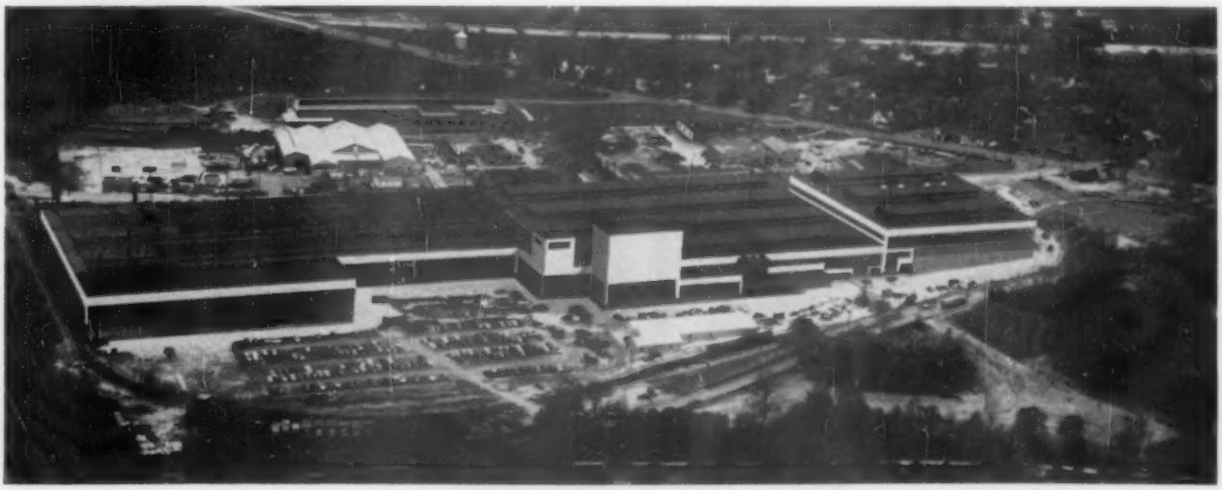
The use of these large extrusions will, in many applications, eliminate the costly production and assembly of smaller component parts.

Company engineers should prepare designs promptly in order to overcome the required lead-time and benefit from the presses' early operations.

Kaiser Aluminum engineers with long experience in extrusions are eager to work with you on your designs. If you would like to see how heavy aluminum extrusions fit into your production, you are urged to take immediate advantage of this service. Contact Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois. *Executive Office*, Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service



Aerial view of the new Kaiser Aluminum plant which will house the two 8,000 ton heavy extrusion presses. Plant is located adjacent to existing Kaiser Aluminum facilities at Halethorpe, Maryland.

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- Hard Chrome Plated Bodies and Piston Rods
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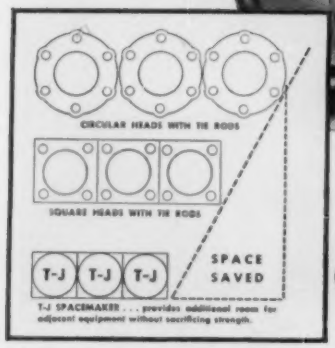
Lock	Time
Brake	Blank
Press	Cut
Spin	Broach
Turn	Drill
Grind	Sequence
Weld	Close
Lower	Snub
Squeeze	Form
Bend	Pierce
Coin	Feed
Saw	Mill
Tap	Convey
Index	etc.
Braze	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SQUARE HEADS WITH TIE RODS
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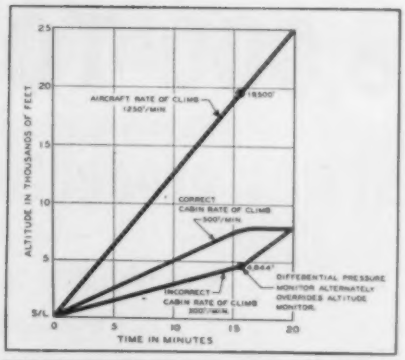
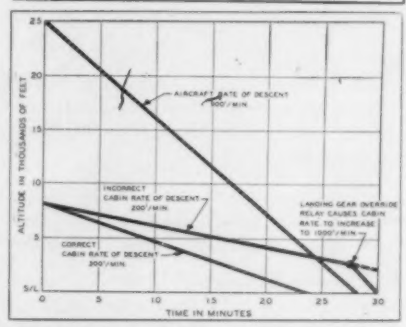

ALTITUDE IN THOUSANDS OF FEET
TIME IN MINUTES
AIRCRAFT RATE OF CLIMB 1250'/MIN
CORRECT CABIN RATE OF CLIMB 500'/MIN
INCORRECT CABIN RATE OF CLIMB 300'/MIN
DIFFERENTIAL PRESSURE MONITOR ALTERNATELY OVERRIDES ALTITUDE MONITOR.


ALTITUDE IN THOUSANDS OF FEET
TIME IN MINUTES
AIRCRAFT RATE OF DESCENT 500'/MIN
INCORRECT CABIN RATE OF DESCENT 200'/MIN
CORRECT CABIN RATE OF DESCENT 300'/MIN
LANDING GEAR OVERRIDE RELAY CAUSES CABIN RATE TO INCREASE TO 1000'/MIN.

GRAPHS show effect of climb and descent rates on cabin pressure control system.

the airlines. They claim the system controls cabin pressure change with an exactness beyond the capacity of a human being to sense. Extensive tests on regular airline flights show that passengers usually don't feel pressure change within the cabin during climb or letdown, Kollsman says.

A comfort feature designed into the system assures that, at landing, the cabin pressure will always decrease automatically at a comfortable rate to correspond to field elevation.

Pressure Monitor

Here is a general description of how a differential pressure monitor works:

A fitting feeds one of the two pressures to be measured to the inside of the monitor's diaphragm. Another fitting allows the second pressure to enter the instrument's case where it acts on the outside of the diaphragm. (In an absolute pressure monitor, an evacuated diaphragm is used and ambient pressure acts on the outside of the diaphragm only.)

Expansion or contraction of the diaphragm is transmitted to a rocking shaft through a link and calibrating arm.

The link is attached to a temperature compensator mounted on the diaphragm centerpiece. Any diaphragm movement swings the rocking shaft, is one direction or the other, on frictionless spring pivots.

Amount of rocking shaft motion is adjustable by moving the calibrating arm in or out of the shaft.

A C-shaped iron armature is attached

Electronic Favorites in the GAGE LABORATORY

These Sheffield electronic instruments are ideal for:

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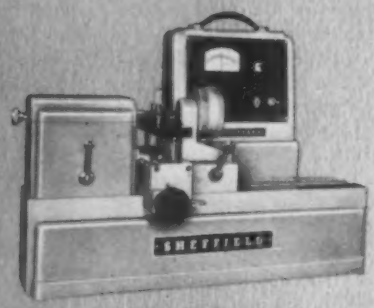
4. *Checking precision tools and threads*

The particular electronic circuit in these instruments is exceptionally stable. Protection from disturbing line voltage fluctuations eliminates drift, prolongs vacuum tube life and permits continuous use without the inconvenience of resetting.

The indicating meters respond instantly but without overshooting, for quick, accurate readings. Remote gage head location precludes any thermal effects due to vacuum tube operation. *Fixed Gage and Inspection Room, Instrument Division, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.*

ELECTRONIC N-6 INTERNALCHEK: Choice of the world's finest laboratories; Amplifications, 1000/2000 Dual, 5000/10,000 Dual, 5000 Single; work part diameter, .240" to 12.000"; gaging depth, 1.5".

ELECTRONIC HEIGHT GAGE: First choice of the toolroom; Amplification 1000/2000 Dual; scale range, .003"; smallest graduation, .0001"; overall vertical range, 26".



NEW HORIZONTAL EXTERNALCHEK: Dual amplification, 1000/2000 to one; capacity 12"; vertical table travel 2½"; micrometer tailstock with 1" adjustment.

NEW ELECTRONIC COMPARATOR: Dual amplifications, 1000/2000 and 5000/10,000 to one; scale ranges .003", .0015", .0006" and .0003"; vertical capacity, 6"; anvil, 1¼" x 5".

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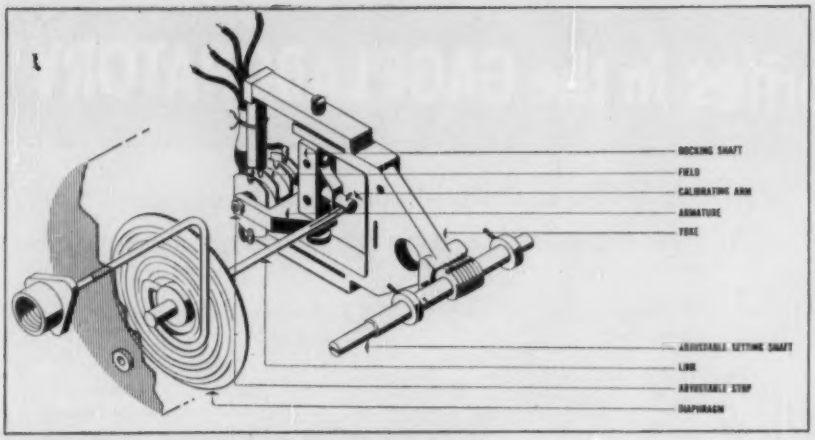


DIFFERENTIAL PRESSURE MONITOR SCHEMATIC

to the rocking shaft. An iron field structure carries four symmetrically wound coils connected in an inductive bridge. The field is mounted on a yoke which turns in bearings concentric to those of the rocking shaft.

When the armature is centered about the field structure, the bridge is balanced and the monitor's output is null. When armature is moved, inductance of one side increases as the other decreases resulting in a voltage output from the bridge. Voltage is inducted in proportion to the displacement of the armature, and voltage phase reverses as the armature moves from one side to the other.

Field structure motion within the armature can be limited by two screws and locknuts.

Kollsman engineers say the monitor's simple mechanism gives fine resolution while efficient design of the inductive pickoff produces high output and large signal-to-null ratios.

The yoke, carrying the field structure, can be adjusted through a rotating shaft-and-worm gear arrangement. Nonjamming stops limit adjustment shaft rotation. Link to diaphragm is slotted to allow diaphragm movement after field structure comes up against either stop screw.

Backlash in the mechanism is taken up by a series of coil springs.

Photoelectric Sextant

Another new Kollsman product is an automatic sextant, said to be the first ever developed for aerial navigation. A device such as this could be used in a guidance system for long range missiles.

The new instrument automatically sights and tracks the sun by day and preselected stars or planets during the night.

By staying locked on a star and continuing to track it automatically during and after course changes, the sextant eliminates the need for manual sighting, according to Kollsman. This will simplify a navigator's job, save him time and reduce possibility of human error. In addition, the sextant is remotely controlled. Because today's military flight crews wear cumbersome pressure suits and modern bombers have little room in which to move, these two features ease the navigator's job.

The new photoelectric sextant may be located remotely from the navigator in any position on the aircraft where it has an unobstructed view of the sky. Navigator takes his information directly from a remote indicating and control panel.

Accuracy of the new device is given as two miles.

The sextant is made up of three components:

• **Sextant tracking device.** This unit contains a photosensitive telescope which automatically searches for the celestial body the navigator has selected to be tracked. After finding it, the tracking device locks on to the star and continues to follow it automatically.

KOLLSMAN PHOTOELECTRIC sextant's tracker. A device like this may guide tomorrow's intercontinental missiles.

Changing course doesn't affect the device's tracking ability. The telescope photoelectric scanning system is designed to be unaffected by auroral phenomena, haze or moonlight.

• **Amplifier.** An amplifier boosts current received from the tracking device to operate indicators in the remote control panel.

• **Remote indicator and control panel.** This black box, which measures less than 8 in. across, contains all controls necessary for sextant operation, and three indicators which show star azimuth, true heading and altitude. An indicator light shows "T" for tracking or "R" for reading. The control panel is the only part of the system to which the navigator must have access.

This is how the photoelectric sextant operates:

The navigator presets on the control panel the estimated position of the celestial body on which a fix is to be taken. The sextant then takes over. The tracking device, incorporating the photosensitive telescope, searches for the star selected by the navigator, sweeping from right to left at several different elevations, scanning a patch of sky 7 deg. wide by 5 deg. high, until it recognizes the selected star.

When the star is recognized, the system locks on and begins its tracking operation. To alert the navigator, a "T" lights up on the indicator and control panel.

To start an automatic averaging period, a toggle switch is thrown. When the averaging period is over, the "T" light changes to "R" to tell the navigator that he can now read the star's average altitude.

Since the photoelectric sextant automatically tracks a celestial body in spite of course change, the same star may be "shot" several times to determine true heading accurately. Also, when a star is tracked in level flight, the system will measure relative bearing accurately, allowing the navigator to find true heading or star azimuth.

High-Altitude Telescope

A high altitude telescope for precision navigation and bombing is another and recent Kollsman development.

Unusual optical and mechanical design of the telescope allows operators visually to identify landmarks or targets while dressed in pressurized flight gear, with "fishbowl" masks, which prevent them from getting their eyes close to the instrument's eyepiece. With previous telescopes, operators had to get their eyes close to the instrument's eyepiece to use it.

The Kollsman telescope has a 60-mm. eye relief and 10-mm. exit pupil.

ROR bonus boost for helicopters

Reaction Motors' new Rotor Rocket system of auxiliary power for helicopters is another important milestone in a list of impressive firsts in rocket engine design and performance. This lightweight system, originally developed for the U.S. Navy Bureau of Aeronautics, was recently demonstrated in a Sikorsky HRS-2 Marine Corps helicopter. When installed in the HRS-2 helicopter the ROR auxiliary power enabled the copter to lift more weight at take-off, provided more power for climb, greatly increased gliding range and hovering ceiling.

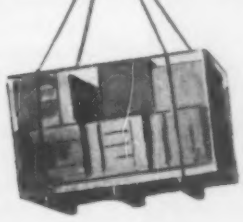
ROR systems and other RMI power applications can be adapted to many types of existing helicopters with very little modification, resulting in an increase in their tactical value under critical performance conditions.

ROR steps up performance 4 ways: **1** ...Lifts more weight at take-off

2 ...Increases rate of climb

3 ...Increases hovering ceiling

4 ...Extends glide range



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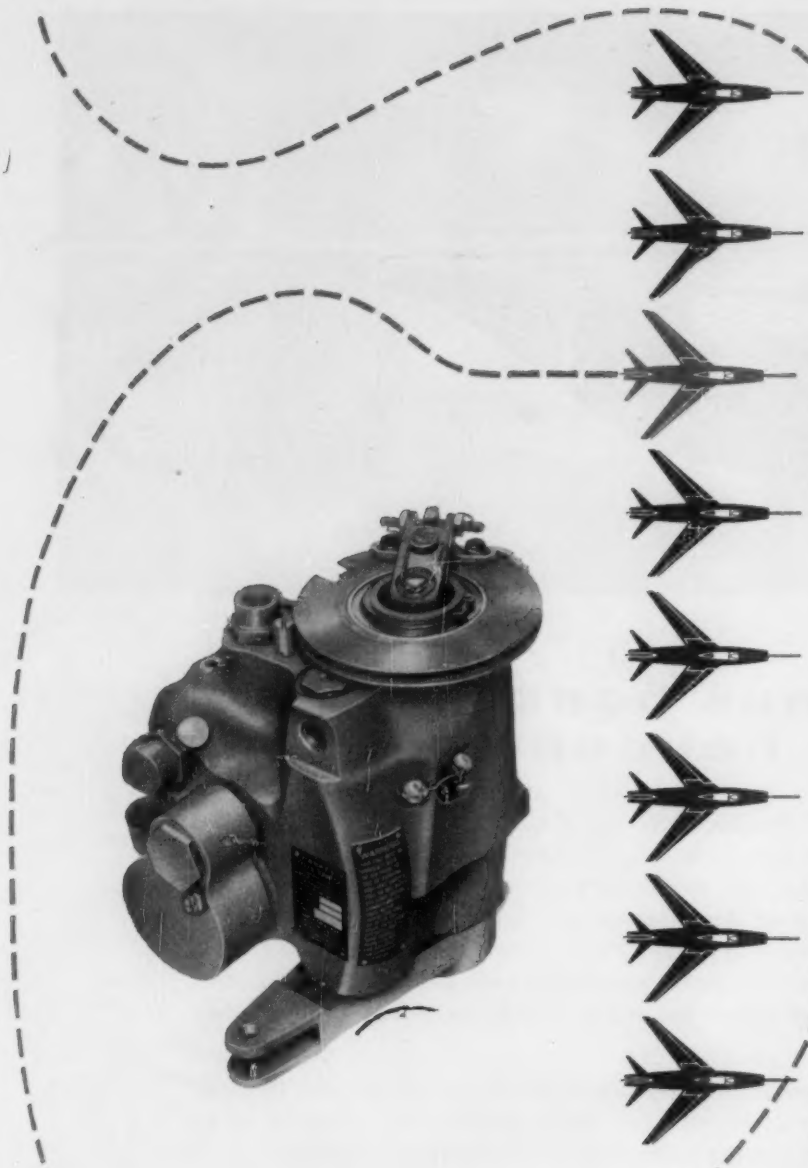


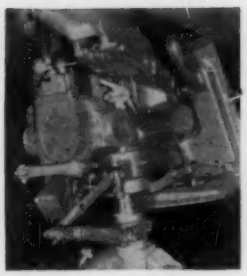
POWER STEERING

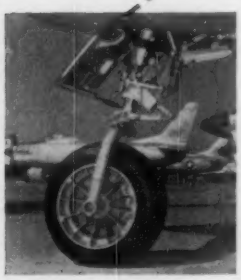
provides faster, safer maneuverability

Loud and Haskel are pioneers in the design and development of power steering. With the advent of jet aircraft, it was necessary to provide the pilot with controls that would insure faster and safer ground maneuverability.

Loud was the originator of the first package assembly including power steering cylinder, steering control valve, shimmy damper, damping orifices, and thermal temperature compensators all in one unit assembly. Loud was the first large volume producer of this rotary output assembly steering unit, and has now become one of the largest producers of power steering for aircraft in the country.

"Producing Today... Tomorrow's Aircraft Requirements" has resulted in many "firsts." An example is the design and development of electrical control for power steering, to replace all mechanical connections between pilot and nose wheel. Now the pilot has closer control than ever before obtained, with considerable savings in weight and initial cost, as well as installation and checkout time in the airplane.





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Turbine Lube Pump Has Two Elements

Suitable for jet engine turbine lubricating oils MIL-0-6081 and MIL-0-6082 over a temperature range of −60 to 300F, Model RD-7150-C pump has two elements—one designed with relief valve for pressure lubrication of engine bearings and the other to seavange the bearing sumps.

Each element has a displacement of 0.256 cu. in. per revolution and a rated capacity of 3.2 gpm. minimum at 0-2-in. Hg inlet suction, 50-psi. discharge and 3,330 rpm. Relief valve is externally adjustable and is normally set at 70 psi. cracking pressure. Weight: 2.75 lb.

Lear, Inc., Lear-Romec Division, Elyria, Ohio.

Lowspeed Motor for Synchronous Uses

A new line of synchronous inductor motors has applications requiring moderately high torque at low speeds, synchronous-speed operation, or rapid deceleration or reversing. Typical installations of these Type SMY motors include recording devices, control and feed motors, and remotely controlled beacons and searchlights.

Units are available in torque ratings of 75 and 2 oz.-in. at 60, 50 and 25 cycles.

General Electric Co., Specialty Component Motor Dept., Schenectady 5.

C-133 Gets Big Cooler

Huge Douglas C-133 turboprop-powered transport will be air conditioned by the big 200-lb. AiResearch turbine at left, whose size contrasts sharply with 5½-lb. turbine refrigeration unit (right) used on Douglas A4D Skyhawk midget A-bomber. C-133 unit could easily cool three standard-size homes, AiResearch says.

From Wyandotte . . . answers to modification & maintenance problems

At Wyandotte's modern research center (above), performance-proven products are developed and tested. Practically any cleaning problem can be duplicated and studied. In addition to huge plants in Wyandotte, Mich.— Wyandotte's vast facilities for producing specialized cleaning products include a new plant in Los Nietos, California.

	YOUR PROBLEM	ANSWER	DESCRIPTION
1	Steam cleaning	Altrex*	Cuts scale formation; removes all types of soil from aircraft exteriors, decks, engines.
2	Emulsion cleaning	1-2364	Meets USAF Specification 20015-E and MIL-C7122 (Aer). Will not craze plastics.
3	Carbon removing	P-1075	Nonflammable, noncorrosive cold-tank carbon remover for jet- and piston-engine parts.
4	Integral fuel-tank desealing	2789	A "universal" desealant for removing all types of sealing compounds. Nonflammable.
5	Removing exhaust stains	#20	Removes stubborn exhaust stains; prevents corrosion in exhaust-stained areas.
6	Washing aircraft exteriors	Aerowash LR231	An excellent emulsion cleaner for regular aircraft maintenance.
7	Paint removing	Sprayee	Aircraft paint remover. Meets Specification AF-14119-C.
8	Engine test-cell cleaning	El-Bee*	An all-soluble cleaner for removing dirt, oil and grease from concrete surfaces.
9	Washing-machine cleaning	397	A special low-foaming, non-etching aluminum cleaner. Meets Specification MIL-C-5543.
10	Aluminum brightening	Alutone*	Brightener for exterior aircraft surfaces. Cleans and brightens in a single operation.
11	Floor absorbent (anti-slip)	Zorball	An all-purpose floor absorbent; makes floors skidproof, safe at lowest use-cost.

*REG. U.S. PAT. OFF.

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Airport Operator: Could he find your airport?

Dealer: Could he find your place of business?

Distributor? Does he know where to buy the products you sell?

This man is important to you. He is one of an ever-growing number of U. S. business pilots who together fly almost 4,000,000 hours every year. He wants to know about you—your airport—your services and products—because he is one of the legion of business pilots who are responsible for operating and maintaining an ever-growing business aircraft fleet that now numbers 21,500. For you, he represents a typical member of the business flying market that the most recent annual figures show spends more than $280 million on maintenance and modification, fuel and oil, and related airplane operating expenses . . . mostly at non-airline airports. Growing at its present rate, business flying will become a billion dollar business by 1965.

Tell this buying-power-packed market about yourself, and measure the results in profit dollars! Put yourself on the map—reach leading business and private pilots with a selling message that lasts all year—by advertising in the brand new, 1955-56 edition of the Aviation Week Airport Directory,—publishing June, 1955. Last year more than 5,300 copies of the Aviation Week Airport Directory were bought by the nation's leading business, executive, commercial and private flyers. These men depend on the Aviation Week Airport Directory as their guide to the airports and airport facilities that can best fill their service needs, and the needs of their passengers, as they travel from one part of the country to another.

Give yourself the representation you deserve. Make your advertising reservations now. Hurry—closing date is June 12. Your advertisement—or a cooperative advertisement with your suppliers—can be placed next to any airport listing in any geographical section you are interested in. Rates are low—about the same as for classified advertising in most newspapers, depending on the size of your advertisement, and your advertisement can be any size—even down to a single line. Fill out the coupon without delay to assure special attention and a good position for your advertisement. Make sure now—today—that leading business and private pilots will know about you.

Aviation Week Airport Directory,
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Please reserve advertising space for me in the 1955-56 Aviation Week Airport Directory and send me full information on rates, sizes, and positions available.

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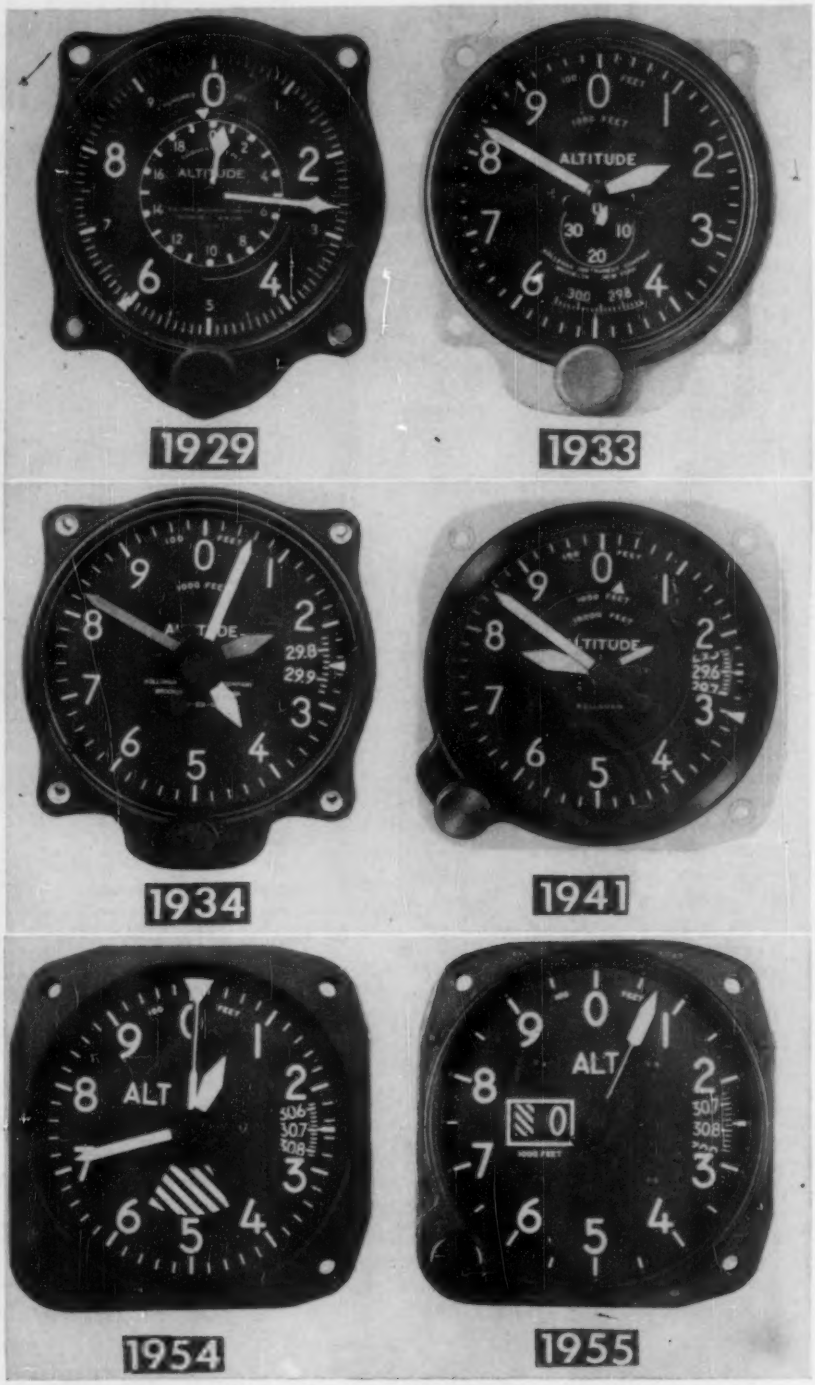

KOLLSMAN DISPLAY of vital cockpit aid that tells pilot how high he is traces . . .

Altimeter History: 26 Years

1929: James H. Doolittle used this Kollsman sensitive altimeter in his famous blind-flying experiments. Limit on this one was 20,000 ft.; display was two pointers—one for hundreds, the other for thousands of feet.

1933: The third pointer came in about now on this sensitive altimeter with a range to 35,000 ft. Large pointer reads hundreds, small pointer reads thousands. On a separate dial, a tiny pointer marks the ten-thousands level.

1934: Red reference pointers characterize this Kollsman design, in one early attempt to make things easier for the pilot. Reading the altitude for landing was not necessary; with the reference pointer set, the pilot could compare

BARBER COLMAN

Aircraft Controls

. . . high speed remote positioning systems for rapid, accurate response

Utilizing a unique velocity feedback circuit, this Barber-Colman high speed positioning system is designed for remote control of aircraft throttles, jet afterburner valves, test cell apparatus, and various other aircraft applications. Rapid, accurate response at high velocities is obtained without hunting . . . at speeds up to 90° per second (15 rpm) or one inch per second (linear). This Barber-Colman 26-volt d-c system consists of either a linear or rotary actuator with integral potentiometer, a transmitting potentiometer, and a compact control box. A Barber-Colman Micropositioner, ultra-sensitive polarized relay, provides a simplified non-electronic method of control. On your next remote positioning problem, investigate this accurate, high speed system. It can very likely be your answer.

OTHER BARBER-COLMAN AIRCRAFT PRODUCTS

Temperature Controls
Cycling, full proportional, Micropulse, electronic . . . for military, commercial, and executive aircraft.

Valves
Wide variety of electrically and pneumatically actuated air valves for temperature and pressure control applications.

Actuators
Rotary and linear types combining gear reductions, switching, mountings, and other features to meet most applications in their load-speed class.

D-C Motors
Permanent magnet and split-series types up to 1/10 hp. Also gear heads, blowers, tach generators.

Thermo-Sensitive Elements
A complete line of wire and thermistor sensing elements is manufactured for use in resistance bridge-type control circuits.

Ultra-Sensitive Relays
Polarized relays in sensitivities from 50 microwatts to 1 milliwatt. Wide range of coils, enclosures, mounting details.

In addition to the High Speed Remote Positioning System described above, Barber-Colman also provides a Basic Remote Positioning System for moderate speed control applications and a Mechanical Contact Servo System for simplified positioning control of actuators. Send for technical bulletin. Whenever you have need for remote positioning controls, consult Barber-Colman engineers for the system best suited to your application. Engineering sales offices in Los Angeles, Seattle, Baltimore, New York, Montreal.

Barber-Colman Company

Dept. R, 1422 Rock Street, Rockford, Illinois

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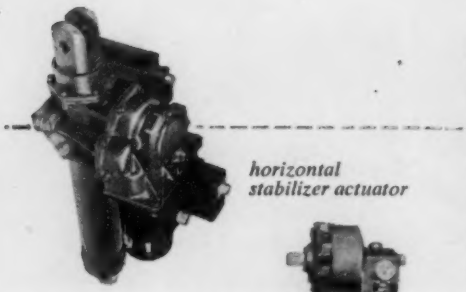
helps fly giant
MARTIN SeaMaster



horizontal stabilizer actuator

dual-powered rotary actuator

starter drive

world's first multi-jet seaplane

Highly classified components designed and manufactured by Western Gear perform important functions aboard this huge Navy aircraft, world's first multi-jet seaplane for mine laying and photo reconnaissance. Four jet engines provide speeds in excess of 600 MPH and a cruising altitude of 40,000 feet. Its T-shaped tail towers three stories.

Selection of Western Gear by its builders, the Glenn L. Martin Company, for the design and construction of these units is a priceless expression of confidence.

Since 1888 Western Gear has designed and manufactured gears and special machinery. For 40 years a major portion of this activity has been devoted to the production of aircraft components. This highly specialized experience is available for the asking. Don't hesitate to write for information. Or detail your requirements so that we may submit quotation. Address Executive Offices, Western Gear, P.O. Box 182, Lynwood, California.

"The difference is reliability" • Since 1888

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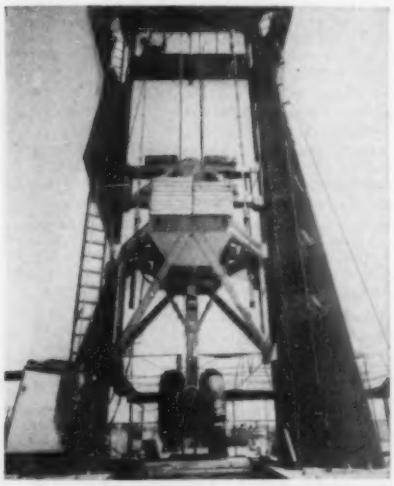
the white indicator with the red reference.

1941: One dial, three pointers, and a range of 50,000 ft. characterize this Army model altimeter. This was one of the standard instruments that lived through World War II to influence post-war cockpit instrumentation layouts.

1954: Still one dial, and three pointers but a shaded area for easy reference has been added. When it is obscured, the altitude is about 17,000 ft. The 10,000-pointer is extended out of the cover of the other hands.

1955: One pointer, one counter on this sensitive altimeter. The counter reads thousands, the pointer indicates hundreds, in this design aimed at improved readability of altitude. This could be the last of the "clocks."

Next: Instrument experts favor the slide-rule or vertical-scale presentation of altitude information, somewhat like the Hughes proposal (AW Apr. 25, p. 31). In such schemes, a visual comparison of altitude is directly given without any need to read numbers; the indicator is a plane silhouette superimposed on a vertical graduated scale with a terrain-clearance line or shaded area at the bottom. A digit counter records the actual altitude of the aircraft at all times.



Lockheed Tortures Landing Gear

Development of lighter, stronger aircraft landing gears is the purpose of this 40-ft. drop test tower at Lockheed Aircraft Corp.'s research center, Burbank, Calif. Elaborate strain gage load and displacement measuring devices made by Baldwin-Lima-Hamilton Corp., Philadelphia, determine motions of the gear while it is dropping and the forces applied to it during simulated landing. A Constellation's main gear is shown rigged for testing. Heavy weights on platform above the landing gear aid in simulating actual plane's weight.

B·H

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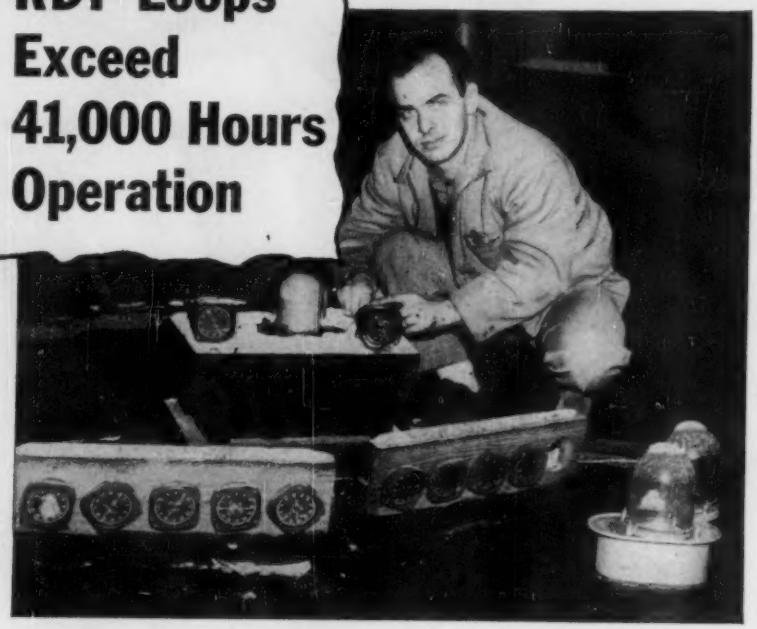
LOWEST COST HANGARS OBTAINABLE... QUICKLY ERECTED—LOW MAINTENANCE—OVER 100 INSTALLATIONS THROUGHOUT THE WORLD. DOOR OPENINGS TO 200 FT.—HEIGHTS TO 60 FT.... ONLY ANDERSON HANGARS HAVE THE NEW HIGH-STRENGTH BOLTED-ON RIBBED SHEET. *Call or write now.*

Kearfott RDF Loops Exceed 41,000 Hours Operation

Test Made with Equipment Exposed to Full Range of Weather Conditions.



The Kearfott AS-313 Radio Direction Finder Loop and the ID-90 Indicators withstood continuous operation for 41,977 hours. This is over 40 times the 1,000 hours required by Air Force specifications for Sealed Aircraft instruments.

The ability of Kearfott equipment to operate long beyond requirements is significant. The same hermetic seal principle employed in the construction of Kearfott Loops is also used to impart dependability and long life to Kearfott Gyros, Computers and Packaged Servo Systems.

The Kearfott organization is available to you to aid in meeting instrumentation requirements of modern airborne equipment.

—Send for Technical Data Sheets

KEARFOTT COMPONENTS INCLUDE:

Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components. Send for bulletin giving data of components of interest to you.

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Many opportunities in the above fields are open. Please write for details today.

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West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

(Continued from p. 65)

Jack & Heintz, Inc., 17600 Broadway, Cleveland, Ohio, starters, 642 ea., $128,766.

New West Paint & Chemical Co., 1150 Revere Ave., San Francisco 24, Calif., resin, 15,120 gal., $28,259.

AiResearch Mfg. Co., 9851 Sepulveda, Los Angeles, Calif., spare parts, modification kits, components and data for type GH4-1 ground heater; not to exceed $710,000.

Bassons Industries Corp., 1432 West Farms Rd., Bronx 60, N. Y., kit visor mechanism without lens, used on type P-1 Series helmets to convert to type P-3, 4,325 ea., lens, visor, flying helmet, neutral color plastic, 2,652 ea., 3,342 ea., 1,506 ea., $52,162.

General Tire and Rubber Co., Akron, Ohio, services to retread 04C-aircraft casings.

National Brief Case Mfg. Co., 512 S. Peoria St., Chicago 7, Ill., brief cast, leather, brown, navigational type, 14,770 ea., $144,-081.

Surety Rubber Co., Carrollton, Ohio, gloves, protective, synthetic rubber, Grade A, 100 pr., 411 pr., 5,893 pr., 1,473 pr., glove, protective, synthetic rubber, grade B, 1,106 pr., 265 pr., 725 pr., 2,893 pr., 337 pr., 85 pr., glove, protective, synthetic rubber, grade C, 680 pr., 2,716 pr., $34,394.

Bendix Aviation Corp., Utica Division, Utica, N. Y., repair and modification of starters, 125 ea., $96,134.

Electric Storage Battery Co., Exide Industrial Div., 42 So. 15th St., Philadelphia, battery, aircraft, storage, 5,005 ea., $225,725, 620 ea., $27,962, 3,135 ea., $77,277.

Gould-National Batteries, Inc., 35 Neoga St., Depew, N. Y., battery, aircraft, storage, 17,964 ea., $781,972.

Reading Batteries, Inc., 4700 Fifth St., Highway, Reading, Pa., battery, aircraft storage, 3,135 ea., $80,977.

M. B. Manufacturing Co., Inc., 1060 State St., New Haven 11, Conn., vibration exciter, 1 ea., control cabinet, 1 ea., degaussing coil, 1 ea., $34,277; generator, 1 ea., vibration exciter, 1 ea., control cabinet 1 ea., rotary power supply 1 ea., $28,709.

William Miller Instrument, Inc., 325 N. Halstead Ave., Pasadena 8, Calif., system, recording, 1 ea., $27,285.

John Hopkins University, 34th and Charles, Baltimore 18, research and reports on "Separation of a Turbulent Boundary Layer," $40,879.

Regents of the University of California, Berkeley 4, research and reports on "Effects of Chronic and Acute Whole Body Ionizing Radiation Exposures on the Occurrence of Cardiovascular Renal Lesions," $91,000.

American Phenolic Corp., 1830 S. 54th Ave., Chicago 50, cable, 164,375 ft., $34,454.

Anaconda Wire & Cable Co., 1 River St., Hastings-On-Hudson, N. Y., cable, 188,-500 ft., $90,291.

Continental Copper & Steel Industries, Hatfield Wire & Cable Div., 487 Hillside Ave., Hillside, N. J., wire, electric, 427,000 ft., $49,711.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., film, 4,000,000 ft., $50,-240.

General Electric Co., 100 Woodlawn Ave., Pittsfield, Mass., regulators, voltage, 20 ea., $29,360.

General Electric Co., 113 South Salina St., Syracuse, N. Y., airport regulators, 95 ea., $267,525.

International Projector Corp., 55 La France Ave., Bloomfield, N. J., controls, radar set transfer switch, 200 ea., $101,499.

Sterling Precision Instrument Corp., Instrument Div., 34-17 Lawrence St., Flushing 54, N. Y., lobe switches, 218 ea., $255,-324; motors, a. c., 193 ea.; antenna sections, 14 ea.

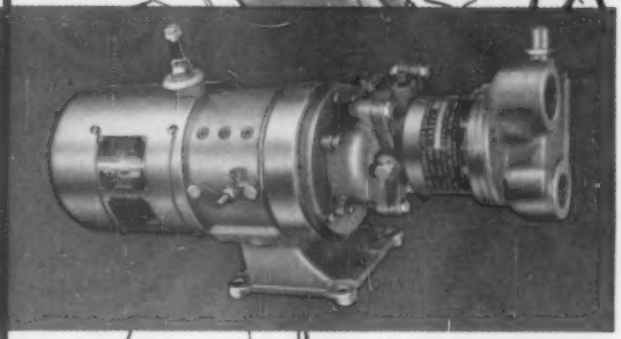
Superior Electric Co., 83 Laurel St., Bristol, Conn., regulators, voltage, 59 ea., $28,953.

ACF Industries, Inc., Engineering Research Div., Hyattsville, Md., modification of F-86D flight simulator, 4 ea., $120,000.

A SPECIALIST DOES IT BEST

- Adel Precision Products

M.D.



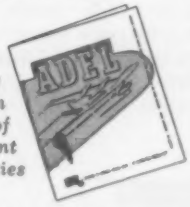
Where your projects are *expertly* engineered, *precision* manufactured, and tested under the complete control of *specialists*. When you specify aircraft accessories made by ADEL, you are assured *all-around reliability*... the direct result of *"specialized"* responsibility.

Thorough research, advanced engineering and sound production which distinguish ADEL products have provided and will continue to provide major contributions to the aircraft industry.

In all, whether your project calls for hydraulic & pneumatic control equipment; anti-icing, heater & fuel system equipment; engine accessories or line supports made by ADEL, you can be sure that *here* it is in *responsible hands*...with exacting quality control *at every step* from engineering, through production, to application.

BE *Adel-wise*... SPECIFY ADEL

Write for descriptive Brochure containing detailed information on ADEL's line of Aircraft Equipment and facilities



ADEL

PRECISION PRODUCTS

A DIVISION OF GENERAL METALS CORPORATION

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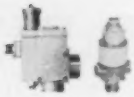
CANADA: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

ADEL designs and manufactures aircraft accessories in the following major categories:

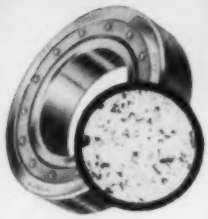
HYDRAULIC & PNEUMATIC CONTROL EQUIPMENT



ANTI-ICING, HEATER & FUEL SYSTEM EQUIPMENT

ENGINE ACCESSORIES

LINE SUPPORTS



THE SECRET of this extraordinary new bearing is the ability of its porous sintered bronze cage to retain many hours' reserve supply of oil. Each tiny interstice acts as a life-saving "oil well" which prevents bearing failure even when all outside lubrication has been interrupted for hours at the tremendously high rpm's developed by jet engines.

OIL PRESSURE ZERO-

but his jet's new HYATT Bearings will run for hours without a drop of lubrication!

Today they're setting performance records in the lab—tomorrow they'll be saving planes and pilots in the air!

For these sensational new sintered bronze cage roller bearings, perfected by Hyatt engineers, have proved beyond a doubt that they can lick the oil-failure problem. Applied to the compressors and turbines of jet engines, Hyatt "Safety Reserve" Bearings have *performed perfectly for more than 30 hours with no lubrication whatever.* This historic contribution to aviation safety once again demonstrates why we say: When you're faced with a formidable "bearing barrier," *come to Hyatt for help!* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT

ROLLER BEARINGS

STRAIGHT BARREL TAPER

Ford Speeds J57 Disk Machining

Compressor disks for the Ford-built, Pratt & Whitney J57 turbojet now are machined on both sides simultaneously in a converted lathe that used to turn out piston-engine crankshafts.

The development is credited to Ford Aircraft Engine division's semi-production department, a group organized to supply critically needed parts when vendors or manufacturing fall behind schedule.

Basic difficulty with the J57 disks is because of their thin section, in one area only ⅛ in. thick. To machine this stainless steel is a problem: the disks tend to dish if too much tool pressure is applied, processing time is high because of the number of times each disk must be turned during finish-machining, and scrap losses have proved to be very high.

Solution to the problem—which bothered Pratt & Whitney and Thompson Products, as well as Ford—was found in the conversion of an obsolete Wickes Center Drive lathe. Tool designers estimated one year for conversion; instead, the job was done in about five months in semi-production.

Results: Set-up time has been decreased 75%, output of the disks has doubled, quality has been improved and scrap losses are negligible.

Boeing Checks Metal

To help predict formability characteristics of metals, this true stress-strain recorder has been developed by Boeing Airplane Co. As a metal sample is pulled at both ends, the machine constantly measures the changing cross-section.

These measurements are plotted with other factors to give a true stress-strain curve. Boeing says that conventional stress-strain recorders plot effects of load against only the material's original cross section.

Central Mail Pay Set

A final mail rate has been set for Central Airlines by the Civil Aeronautics Board for the first time since the carrier started operations.

CAB has ordered Central to show cause why it should not be paid $7,721,666 for the period between start of operations, Sept. 15, 1949, and Dec. 31, 1954. This includes a break-even need of $7,526,259 and an earnings element of $195,407.

The proposed mail pay is approximately $456,000 more than the local service carrier has received during the period involved under its temporary payment rate.

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SIMPLE. START WITH T-E 'COUPLES... ADD T-E'S NEW CONNECTOR.
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Here are three new products—the latest in T-E's expanding line of pyrometric equipment for the aviation field. That line includes not only individual items but complete thermocouple systems—with harnesses, thermocouples, leads and connectors all carefully made in T-E's own plant.
Furthermore, T-E can design and produce the special temperature-measuring equipment you may need for unusual applications. If you want more information, get in touch with us.
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new polarized chromel alumel connector—compact, light weight, no errors from temperature gradient across connector, withstands severe vibration and high temperatures—1000°F, or more
Pyrometers • Thermocouples • Protection Tubes • Quick-Coupling Connectors
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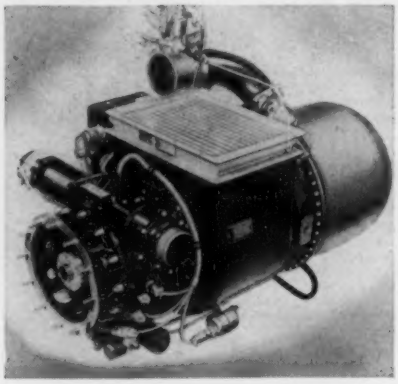
NEW AVIATION PRODUCTS

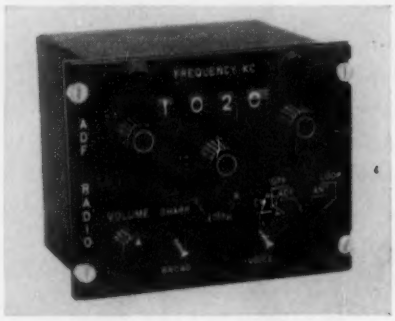


SeaMaster Gets Turbine Starter

Dual-purpose GTCP-85 gas turbine auxiliary powerplant fitted to new Martin XP6M-1 SeaMaster jet-powered flying boat delivers compressed air to start the engines and simultaneously generates electrical power.

Small turbo-powerplant makes the SeaMaster completely independent of outside power sources, the maker says, permitting it to operate from isolated bases.

AiResearch Division, Garrett Corp., Los Angeles, Calif.



ADF Designed to Arinc Specs

Combination radio compass and range and communication receiver handles 90-1,750-kc. frequency range, remote control tuning utilizing two decade switches for channel selection at 100 and 10 kc. intervals. Combined with a variable fine tuning adjustment having a 10-kc. spread, the control provides continuous tuning throughout the specified frequency range, the maker reports. Model ADF-16 system is said to be engineered to Arinc and all applicable Civil Aeronautics Administration requirements.

System's remote control unit is approximately 5¾x4½x4 in. Weight is under 3 lb. Receiver unit with shock mount is about 25 lb. Normal operation can be handled under ambient temperature variation of −55 to 70C, humidity changes from 10%-95% at 50C and at altitudes to 30,000 ft. without pressurization.

Lear, Inc., LearCal Division, 3171 S. Bundy Drive, Santa Monica, Calif.

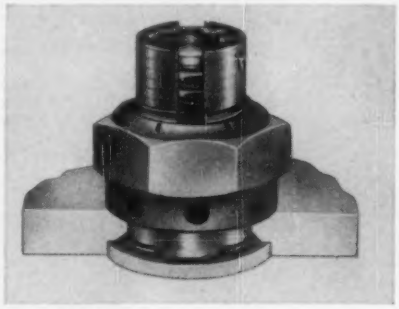
Monomast Lift is Field Installed

Monomast lift, providing improved driver visibility and speeding materials handling, has been designed for field installation on Hyster's UC-30 and YC-40 3,000 and 4,000-lb. lift trucks, the maker reports. The unit will be introduced nationally in July.

Monomast unit is said to afford a 15% increase in lift speed compared with previous installations. Raise speed is 58 fpm., the maker reports.

Piston-type cylinder has a self-adjusting packing gland to minimize oil leakage and extend packing life.

Hyster Co., 2902 N. E. Clackamas, Portland 8, Ore.



Flush Drain for Integral Tanks

Flush mounting drain valve for aircraft integral fuel tanks is supplied in versions that are non-locking or locking in the open position.

Model 5407 is designed to operate in ambients of −65F to 160F. Proof pressure is 50 psi. and weight is 0.077 lb. Basic valve body may be modified to accommodate any thickness wing skin.

Allen Aircraft Products, Inc., Ravenna, Ohio.

Transformer Weighs 0.004 Lb.

Midget Miniformer transformer measuring ¼x⅛x⅛ in. weighs only 0.004-lb.

Model 100W72 has a primary match impedance of 20,000 ohms; secondary 1,000 ohms; d.c. primary resistance of 1,030 ohms; secondary, 167 ohms. Power rating for primary inputs from 1 to 7 v. is 2.5 mw.

The Gramer-Halldorson Transformer Corp., 2734 N. Pulaski Rd., Chicago 39, Ill.

International Plane Coupling

Cast aluminum couplings in 3, 5 and 8-in. sizes, made to American, British and Canadian (ABC) standard for aircraft air conditioning lines, will facilitate cross-servicing of the three national air forces, the maker says. These lines are used to cool aircraft prior to takeoff.

The 8-in. coupling has special hose clamps with handles to permit easier handling. A step-down coupling is also available to permit use of an 8-in. air conditioning line where only a 3-in. outlet is available on the plane.

Wiggins Oil Tool Co., Inc., Los Angeles 23, Calif.

Tester for Aluminum Anodizing

New instrument tests chromic and sulphuric acid-type anodic coatings on aluminum in seconds, according to the manufacturer. The device operates on the principle that the 60-sec. breakdown voltage is proportional to the coating type and thickness; the thicker the coating the higher the breakdown voltage.

Equipment has three voltage ranges: 0-20, 0-100 and 0-600 v. The lowest range handles chromic acid-type coatings; the upper ranges sulphuric acid.

Tester is current-limited to 5 ma.

simplify electronic maintenance... repair... replacement

with Deutsch quick-disconnect electrical connectors

Whether it's routine maintenance checks . . . removal for bench repairs . . . or replacement with complete new units, all of these operations can be made *faster* and *easier* by using Deutsch Quick-Disconnect Electrical Connectors.

To connect, you pull the coupling ring back . . . engage the plug with the receptacle . . . release. The coupling ring springs forward to lock the connection . . . no safety wiring needed. Internal locking mechanism assures strong mechanical lock . . . will not separate accidentally.

To disconnect, you simply pull the knurled coupling ring back . . . no twisting or turning . . . no spanners, strap wrenches, pipe pliers or other tools required.

Deutsch Quick-Disconnect Connectors use standard AN inserts . . . fulfill operational requirements of all AN type connector applications. Insulation material has an arc resistance of approximately 140 seconds and a dielectric strength of about 180 volts per mil. Its lifetime post-mold shrinkage is only .001 inches per inch. Pin contacts are machined from high conductivity copper alloy, heavily silvered for low contact resistance. Socket contacts are precision made from pure copper and are either durable sheet metal or screw machine construction.

Details on shell types, construction, sizes and available inserts are presented in bulletin AWD-3. Write for your copy or see your Deutsch Representative today.

175 types of AN connectors stockpiled

When you need AN connectors, remember *Deutsch can deliver!* . . . over 175 types are stockpiled as complete assemblies. Extensive manufacturing facilities also make possible rapid delivery of modified types.

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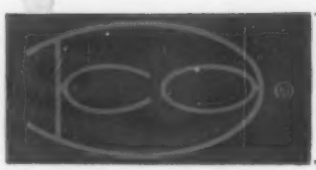


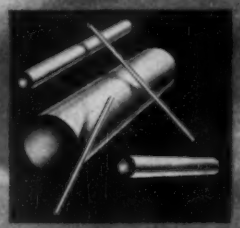
Boeing B-47 Stratojet being refueled in flight by KC-97 tanker equipped with Boeing developed "Flying Boom" system of refueling.

refueling aloft

with TRENTWELD

Here's proof of the dependability of TRENTWELD stainless steel tubing – its use in hydraulic lines in the Boeing "Flying Boom" system of mid-air refueling. TRENTWELD tubing is flying in such other vital places as heaters and jet engines in many different military and civilian aircraft.

It takes tube mill specialists to produce tubing that conforms to such rigid quality standards . . . and that's where the Trent Tube Company excels. Our entire operation is devoted to the production of quality tubing in practically any size from ⅛" up. Through our exclusive fusion-welded process we can provide you with finished tubing in which the weld is equal or superior to the tube body in terms of strength and heat and corrosion resistant properties. And dimensionally the tube is completely uniform throughout.



Your application may be a far cry from mid-air refueling, but Trent engineers are well experienced in solving tubing problems for many diversified uses. Let a specialist help you with your problem by calling in one of our representatives. *You can't buy better tubing than* TRENTWELD.

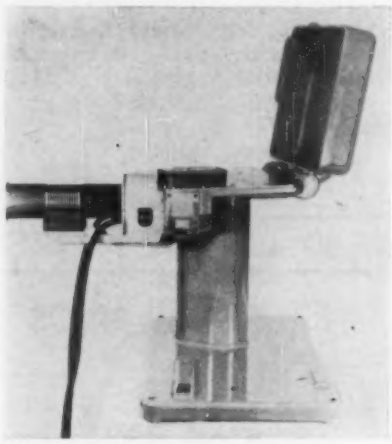
TRENTWELD

STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

to protect the worker from electrical shock. Unit weighs 9 lb.

Sunshine Scientific Instrument, 1810 Grant Ave., Philadelphia 15, Pa.

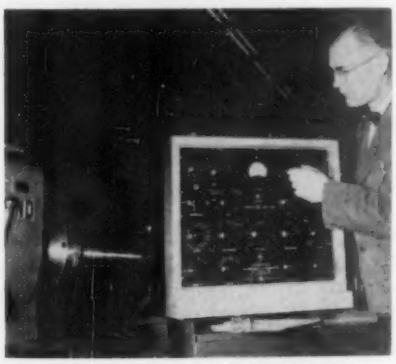


X-Ray Checks Large Slugs

New instrument for use with Norelco wide-range goniometers and designed for X-ray fluorescent analysis of large-slug metal specimens can take items from ⅜ to 1¼ in. deep and 4 to 10-in. square cross-section. Metal cover provides ray-proof chamber.

Instrument for slug specimens embodies a 0.125-in. source collimator and a 0.005-in. receiving collimator and permits the goniometer to work in a range of zero to 146 deg.

Research & Control Instruments Division, North American Philips Co., Inc., 750 S. Fulton Ave., Mt. Vernon, N. Y.



Computer Speeds Machining

Machining problems can be solved in minutes using a new electronic computer that can consider operational variables such as carbide grade, speed, feed, depth of cut, tool life, alloy material hardness and the like.

Costing $500, the 32-lb. computer measures 21x7x20 in. It will become available this September. Each computer will be registered so that the maker can keep owners in touch with late machinability data as available.

The unit was developed by Dr. W. W. Gilbert, formerly of the University of Michigan and now with General Electric Co.'s Manufacturing Services Division, Schenectady, N. Y.

General Electric Co., Carboloy Dept., Detroit, Mich.

Two-Platform Lift Truck

Two independently operating platforms which can be separated as much as 62 in. are featured in new hydraulic-electric lift truck with a 4,000-lb. load capacity.

Upper platform measures 69x24 in.; lower is 53x21½ in. Over-all truck height is 60 in.

Yale & Towne Manufacturing Co., Yale Materials Handling Division, Philadelphia, Pa.

Motor for Miniature Gyros

Hysteresis-driven Type GAA motor for aircraft miniaturized hermetic gyros, applicable to fire control or guidance systems, features open slot construction providing high torque. It is useful in starting in low temperatures without heaters, the maker says. Maintenance-free life of 1,200 hr. is guaranteed.

Motor is rated at 100,000 gram-cm.² radians/sec. at 12,000 rpm. and is de-

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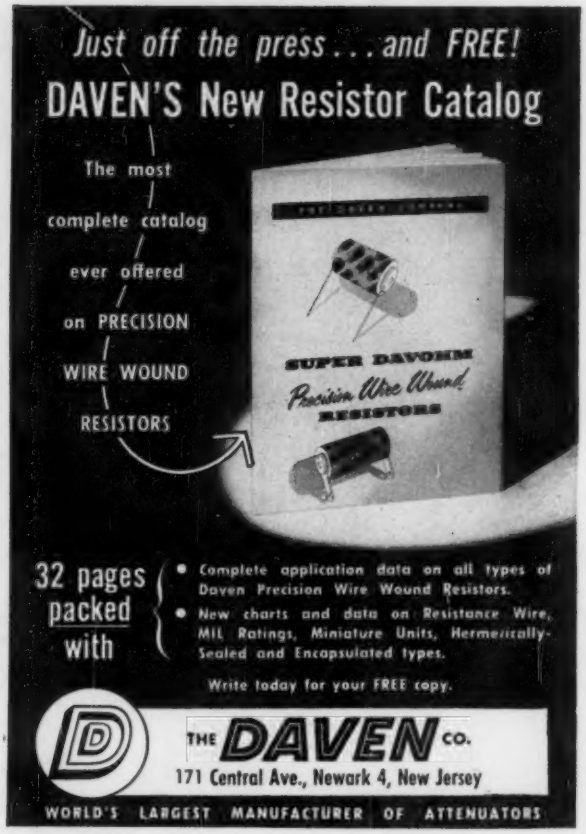
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Weight is 76.4 grams; overall length including mounting shaft is 1.290 in. and wheel diameter is 1.555 in.

To meet floated-type gyro construction, dynamic imbalance is limited through tolerance controls to values less than 0.00092-oz.-in., the manufacturer states.

Westinghouse Electric Corp., Aircraft Dept., Lima, Ohio.

ALSO ON THE MARKET

Tipped-highspeed steel tool bits are welded to carbon-steel shanks maintaining a high Rockwell "C" 65-68. Tools are surface ground to plus 0.000 in. and minus 0.004 in.–Plew Tool Co., Inc., Columbia City, Ind.

Anti-fume pellets for plating baths tends to keep the chromic acid in the solution, preventing escape of fumes, spray and dragout.–Smoothex, Inc., Cleveland, Ohio.

Right-angle drilling on any standard drill press can be handled using self-contained unit that locks quickly with a cam wedge.–Michigan Drill Head Co., P. O. Box 4643, Detroit 34, Mich.

G-400 automatic drill riveter has a throat depth of 24 in., throat height of 17 in. Capacity is 20 rivets per minute. Price $6,800.–General Riveters, Inc., 785 Hertel Ave., Buffalo 7, N. Y.

Kajon air-actuated machine dog works on 75-100 lb. line pressure. At the latter it exerts a hold-point pressure of 600 lb., it is stated. Clamps are set by tightening into position using standard ½-in. bolts.–Burklyn Co., 3429 Glendale Blvd., Los Angeles, Calif.

Direct-reading electronic tachometer uses a tuning fork as a reference and is stated to measure over a 0-60,000-rpm. range with a sustained accuracy of 0.2%. An instrument calibration curve permits accuracy of 0.1%.–Sunshine Scientific Instrument, 1810 Grant Ave., Philadelphia 15, Pa.

Airfeedtapper has an adjustable torque control and micro-depth adjustment, the latter feature enabling blind-hole tapping. Item uses standard Jacobs tapping chucks or Scully-Jones tap drivers.–Keller Tool Division, Gardner-Denver, Grand Haven, Mich.

Height gage scope for 18-in. or 24-in. units replaces scriber or indicator for measuring without physical contact. Combination microscope-telescope provides erect image throughout working

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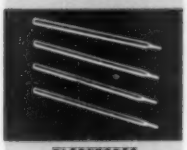

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distance of 2¼ in. through infinity, with 20X magnification closeup and 5X for distant work.–Quality Control Co., 1566 N. Western Ave., Los Angeles, Calif.

Hi-Amp 5403 portable electric welder for light gages has precision timer giving welding accuracy from one-tenth to one second. Accessories will extend throat depth from standard 6-in. to 18 in.–Sittler Corp., 18 N. Ada St., Chicago 7, Ill.

Crown-Pebs, a triangular-shaped, ceramic, barrel-tumbling medium for deburring and finishing, is stated to have service life several times longer than natural stone or aluminum oxide-type tumbling chips.–Crown Rheostat & Supply Co., 3465 Kimball Ave., Chicago 18, Ill.

Fuse control system on all Fenway nibblers will blow if tool is overworked, stopping action before damage occurs.–Fenway Machine Co., 263 N. 23d St., Philadelphia, Pa.

E-Z-Twist wire-twisting tool will open to take wires from 0.05 to 15 gage. Either left or right-hand twist is possible.–All-Purpose Tool Co., 2046 Utica Ave., Brooklyn 34, N. Y.

Type LM/H vibro isolators for machine mounting carry loads of over 17,000 lb. each, the maker reports.–Korfund Co., Inc., Long Island City, N. Y.

Target stud driver for precision engine work drives the unit by pitch diameter pressure instead of conventional pressure atop the stud.–Titan Tool Co., Main St., Fairview (Erie County), Pa.

LTX power bench type punch press can work at 250 operations per minute using ½-hp. motor–Alva Allen Industries, Punch Press Dept., 1001-1015 N. Third St., Clinton, Mo.

High-frequency electric impact wrenches are made in two models: HF24R with a reversing button in the handle, Model HF24, which is non-reversible.–Thor Power Tool Co., Aurora, Ill.

Load hoisting and lowering Hydra-Set works within an accuracy of 1/100-in., the maker states, independent of the crane or hoist control system. Instrument also acts as a crane scale.–Mefco Sales & Service Corp., Glendale, Calif.

Rotolite makes white copies of translucent printed material or photos to 42-in. wide using dry developers.–Rotolite Co., Basking Ridge, N. J.

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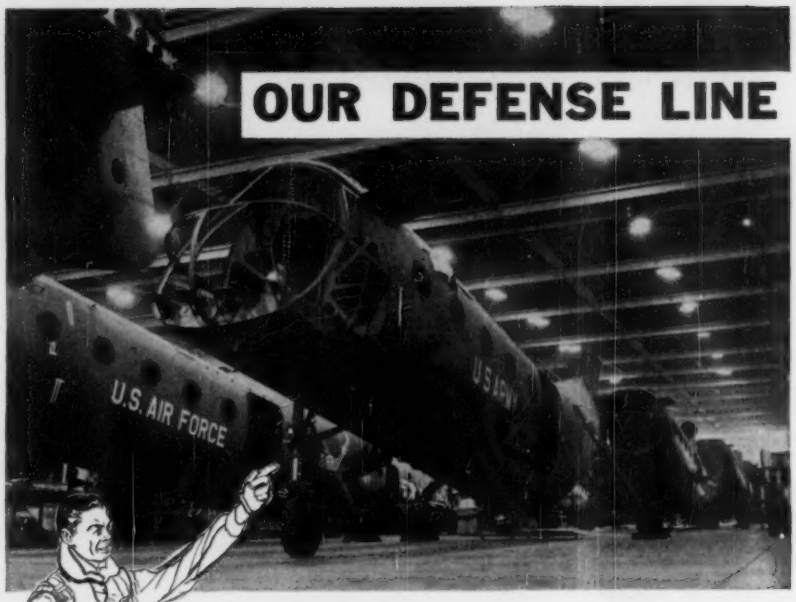

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spindle speeds from 80-3,450 rpm. Accuracy of movement and plane to within 0.00025-in. is guaranteed by the maker. Model number is MC-1.—Linochine Products Corp., 145 42d St., Brooklyn, N. Y.

Electrical control system for predetermined repeat or non-repeat machine cycle can be fitted to any equipment with mechanical tripping mechanism. SCI 200 "stores" electrical energy until hand buttons or foot switch are depressed, disconnecting plant voltage and releasing energy to operate the air motor. Buttons or switch must be released to recharge the control.—Security Controls, Inc., 255 Franklin St., Buffalo 2, N. Y.

Portomag light magnetic drill press can take standard heavy-duty $\frac{3}{8}$, $\frac{7}{8}$ and $1\frac{1}{4}$-in. bit capacities. Unit remains locked in place after current is disconnected.—Lupear's Tool & Die Co., 32681 Northwestern Highway, Farmington 4, Mich.

Aero-Seal Jet stainless steel hose clamp is attached by pushing housing to snug fit on clamp band; worm screw threads then automatically drop into slots. For quick detach, worm screw is lifted and unit springs open.—Breeze Corps, Inc., Union, N. J.

Slotted angle 225-80 framing material is "do-it-yourself" item for fabricating shelving, racks, conveyor mounts, bins, ladders, scaffolding and the like. Assembled with bolts.—Acme Steel Co., Chicago, Ill.

Lynmatic 101 drill unit has air-feed head and adjustable hydraulic feed control permitting rapid traverse to work and return. With automatic control box and cycle timer, the unit can step- and peck-drill.—Burklyn Co., 3429 Glendale Blvd., Los Angeles 39, Calif.

Silicone rubber Class 700 remains flexible at 600F for at least 150 hr. and is suitable for molding extrusion or calendering.—Silicone Products Dept., General Electric Co., Waterford, N. Y.

Thin-strip four-high rolling mill handles ferrous and non-ferrous material to 8 in. wide at speeds to 500 fpm. Mill will roll down to less than 0.001-in. finishing gage at total thickness tolerance of 5%.—Stanat Manufacturing Co., Inc., Long Island City, N. Y.

Reuseable VCI-lined cushioned bags, for shipping metal and electronic parts, will prevent rust and corrosion for up to 10 yr., the maker reports. Bags are available without corrosion-resistant liner.—Jet-Pack, Inc., 859 Summer Ave., Newark 4, N. J.

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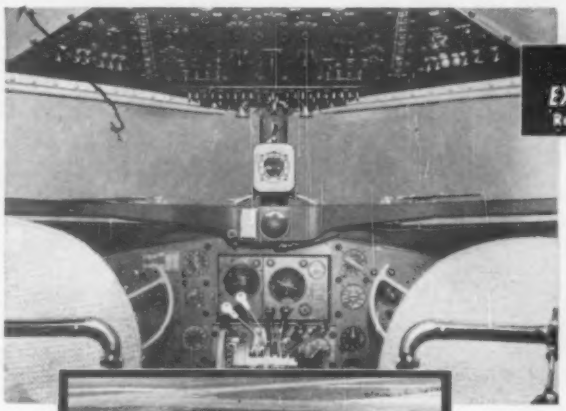

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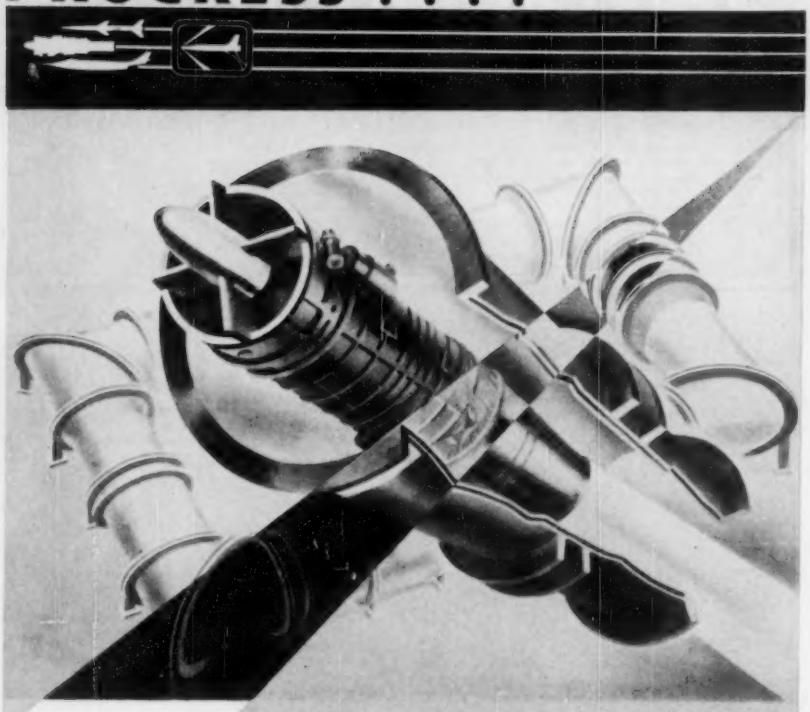

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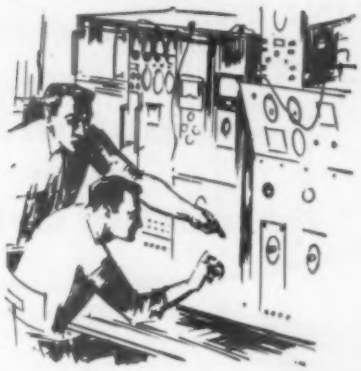
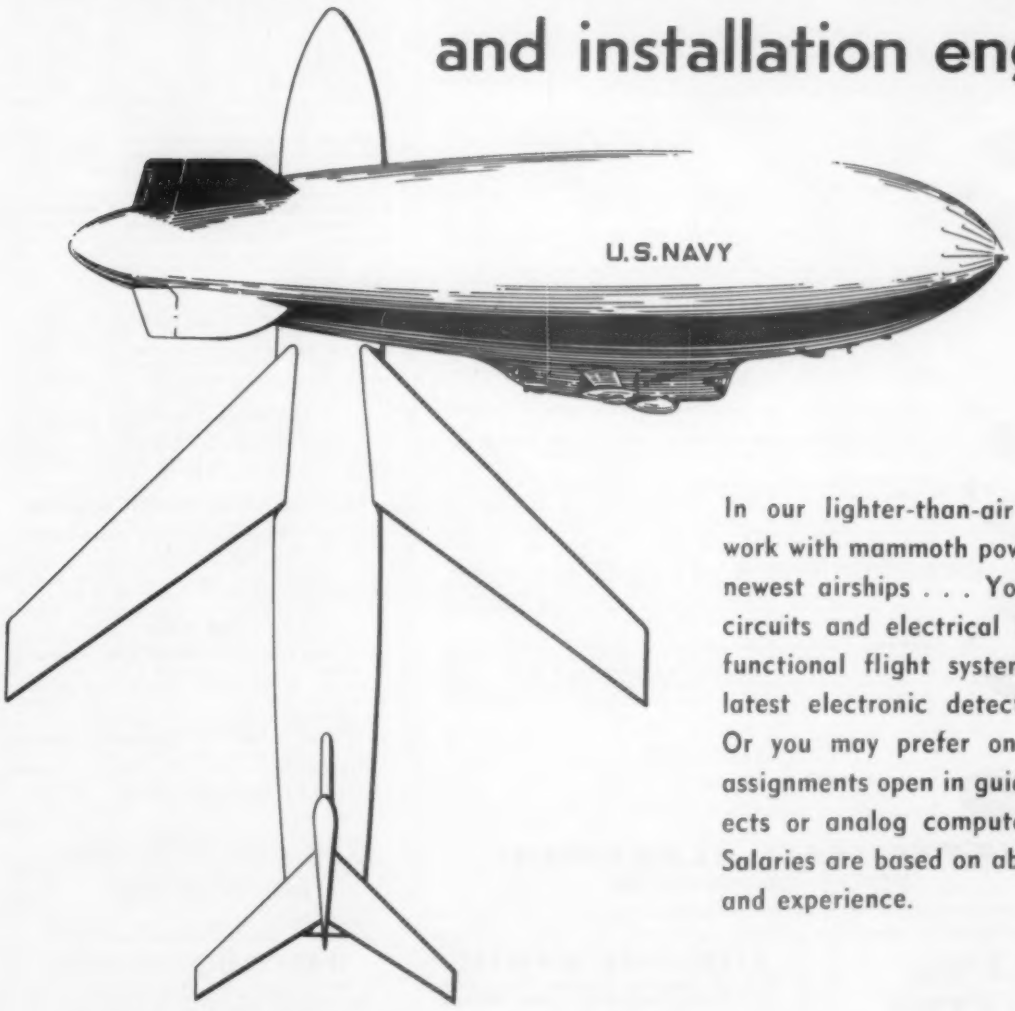


electrical and electronics systems and installation engineers



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SENIOR AERODYNAMICIST An aerodynamics engineer (5 years or more experience, experienced in static and dynamic stability of airframes and autopilots. Able to investigate stability and control problems in detail with only general guidance. Original ideas and initiative required.

SENIOR AERODYNAMICIST Four to five years experience in performance to do drag analysis. Must be familiar with the drag problems of supersonic aircraft.

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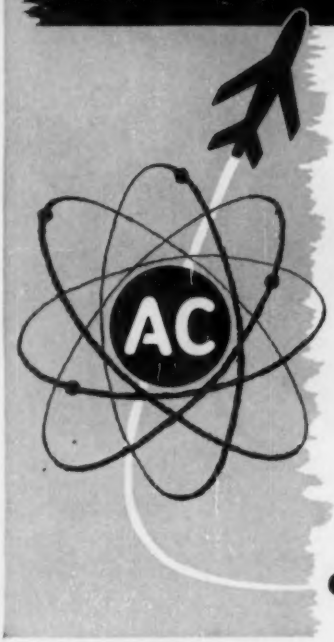

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C-6721, Aviation Week
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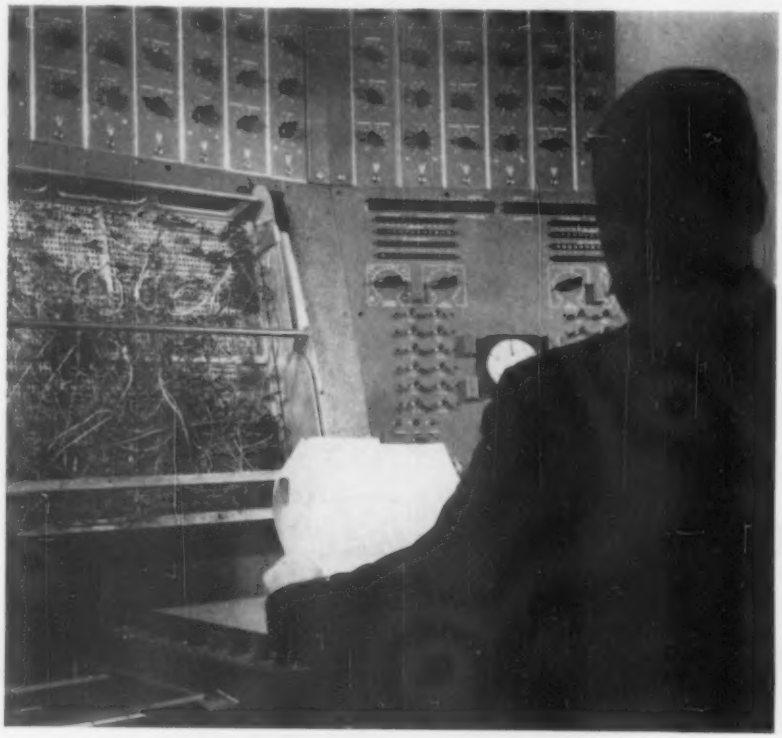
SEEKING THE CHALLENGING PROJECTS IN



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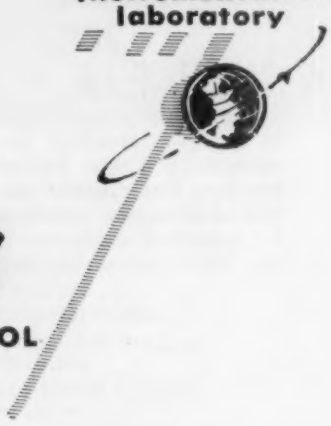

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P-6692, Aviation Week
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Effective with the July 4th issue, a new section will start in AVIATION WEEK. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. New advertisers will be billed at the transient rate of $23.35 per inch, unless on contract. Contract rates furnished on request. Ads are subject to Agency Commission.

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	Electrical Engineers			Mechanical Engineers			Physical Science			Chemistry Ceramics Glass Technology Metallurgy		
	1-2	2-3	4+	1-2	2-3	4+	1-2	2-3	4+	1-2	2-3	4+
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AIRBORNE FIRE CONTROL			W						W			
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RADAR—Circuitry—Antenna Design—Servo Systems—Gear Trains—Intricate Mechanisms—Fire Control	X	F X	M C F X	X	F X	M C F X	X	F X	M C F X			
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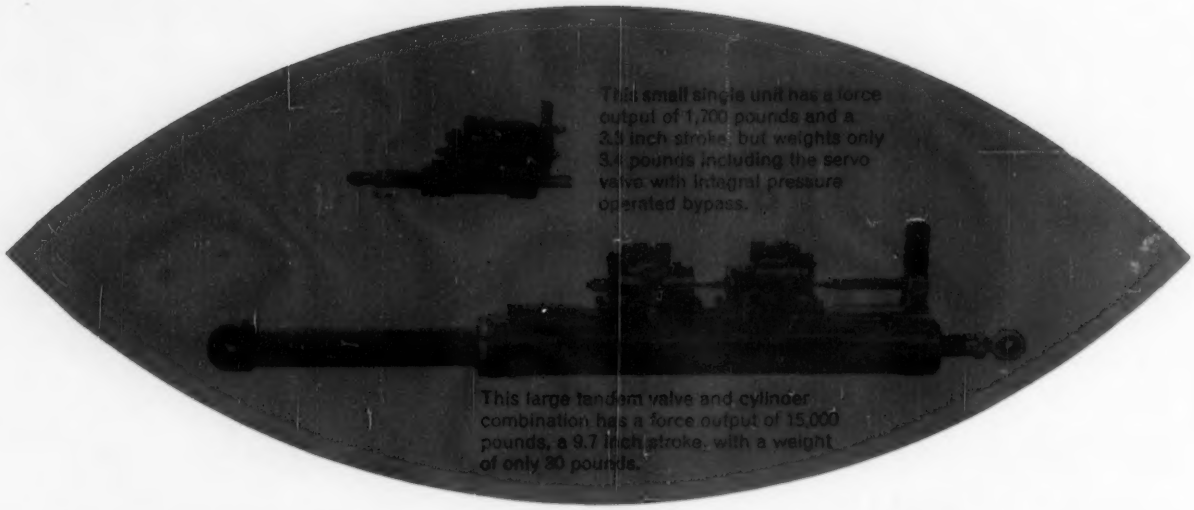
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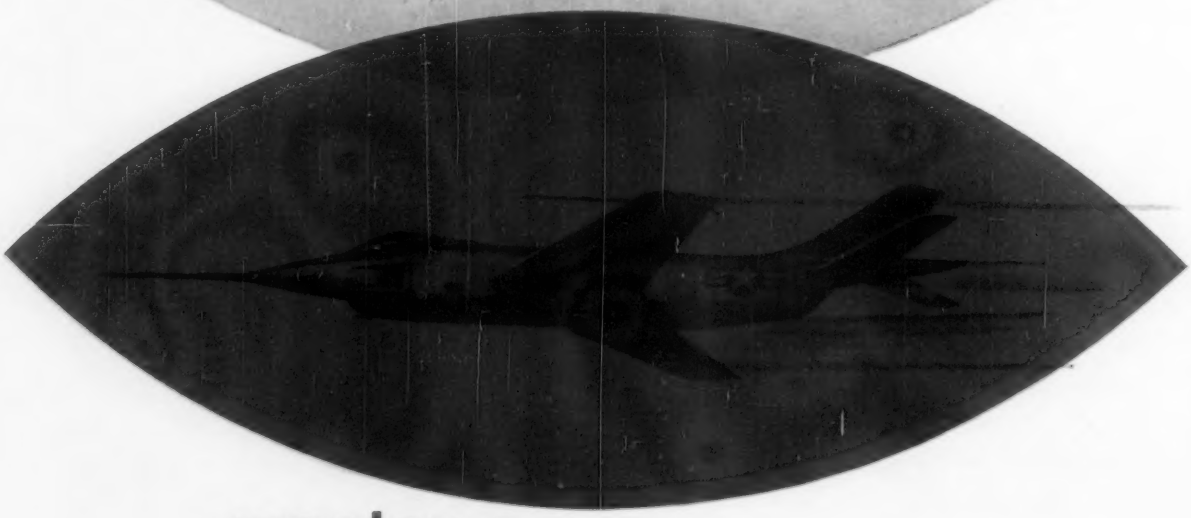

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TO AMERICAN BUSINESS...

Thanks for Taming a Wild Horse

This is a message of appreciation to American industry. The occasion for the message is the completion of our eighth annual McGraw-Hill Survey of Business' Plans for New Plants and Equipment.

To a considerable degree, our appreciation is personal. It goes to the companies whose cooperation made our survey possible. Twice as many companies as in any previous McGraw-Hill annual survey carefully answered our questions about their plans to invest in new producing facilities. They gave a great deal of expensive time to the job. The cooperation of these companies, which employ nearly eight million workers, put the results of our survey on the firmest footing, in terms of coverage, it has ever had. For this cooperation we are most grateful.

But our appreciation is much more than personal. It extends in even greater degree to the kind of planning of investment in new plants and equipment which our survey revealed. The nature of this planning holds out promise that American industry is on the way toward bringing under control what historically has been one of the most upsetting forces in the American economy—the violent fluctuations in business capital investment. Progress in ironing out these fluctuations gives occasion for public gratitude.

A full report of the results of the eighth annual McGraw-Hill Survey of Business' Plans for New Plants and Equipment will be sent to anyone requesting it from the Department of Economics, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N. Y.

Very Good Business News

The part of our surveys that attracts the widest interest is the news they give about immediate business prospects. And this year the news is very good. The survey results indicate that American business as a whole plans to invest $29.5 billion in new plants and equipment this year. That is 5% more than was invested last year, and a new high for any year.

Plans for the years 1956-1958 are also remarkably encouraging in terms of the amount of investment in prospect. American business reports that it is already planning to spend within 3% as much for new plants and equipment in 1956 as in 1955. In the past, the expenditures planned for future years have always been sharply lower than those planned for the current year. This is understandable enough. It is sometimes impossible to anticipate all the expenditures that will be necessary a year or more hence. Thus the fact that plans are already made

to spend almost as much in 1956 as this year is very good news about business prospects. The level of investment now planned for the years 1957 and 1958 is also remarkably high — far higher than ever reported for years that far ahead in previous McGraw-Hill surveys.

Taking the Long View

The fact that these plans exist is of immense constructive significance. It clearly indicates that more and more, and now in dramatic degree, American business is taking the long view in making its plans for capital investment. It is developing a program which, if successfully carried out, will go far toward eliminating the habitual, destructive surging and sagging of what is in effect the central power house of our economic system — capital investment by business. Upon the level of this investment depends not only the general state of our prosperity but our progress in raising the American standard of living with new products and new and better industrial processes.

Seven years ago, when we first asked industry to estimate its capital spending beyond the current year, only a small minority of companies could give us any estimates at all. This year, 87% of the cooperating companies—and it was a far larger number of companies—could comply with our request for estimates for the years 1956-1958.

It Pays to Bet on Growth

A number of developments help explain the increase in long-range planning of capital investment. One is the increasing technical complexity of American industry. It often takes longer, in this complicated age, to work out a successful installation of new plants and equipment. Another reason for long-range planning is American business management's increasing conviction that it pays to bet on the demonstrated capacity of the American economy to grow over the long pull. With this goes a corresponding determination not to let short-term business fluctuations upset individual company plans for growth through addition of new plants and equipment. An additional factor, and one of great and increasing importance, is the sense of public responsibility on the part of American business leaders who want to help prevent destructive swings in the levels of new investment.

It cannot be too strongly emphasized that there is still nothing automatic about the carrying out of these long-range plans for business spending. Actual expenditures are still governed in major degree by the general health of our economy. This is fully attested by the fact that the current business recovery has led to a substantial upward revision of the investment plans reported to us last fall when we made a preliminary check of plans for 1955. Either private economic excesses or a reversal of the recent improvements in federal tax policy could gravely upset realization of present plans. Fortunately, neither of these possibilities seems to be an immediate threat.

The very fact, however, that American business management has made these plans and will do its utmost to carry them out is a development of tremendous constructive importance for the American economy. It means that major efforts are being made to tame what historically has been an economic wild horse—the process of capital investment by business. Both for doing it, and for telling us about it in our annual surveys, we extend to American industry our sincere thanks.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

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Meet Robert Ashe,
John Lawton and H. L. Newby

Westinghouse AGT supervising field service engineers. Ashe has the Eastern area out of Norfolk, Lawton the Central area out of St. Louis and Newby the Western area out of Los Angeles. These men and the field service engineers working with them are important reasons why:

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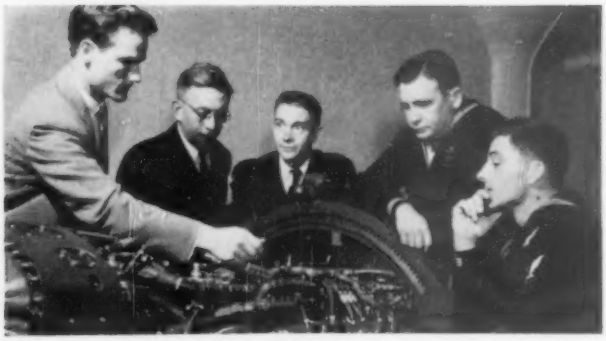

Shown here is a service school conducted at the Westinghouse Aviation Gas Turbine Plant in Kansas City. Its purpose is to train military personnel in the servicing of Westinghouse engines. This activity is typical of Westinghouse service engineering. J-91034-A

For more information on how field service engineering contributes to aircraft performance . . . turn the page

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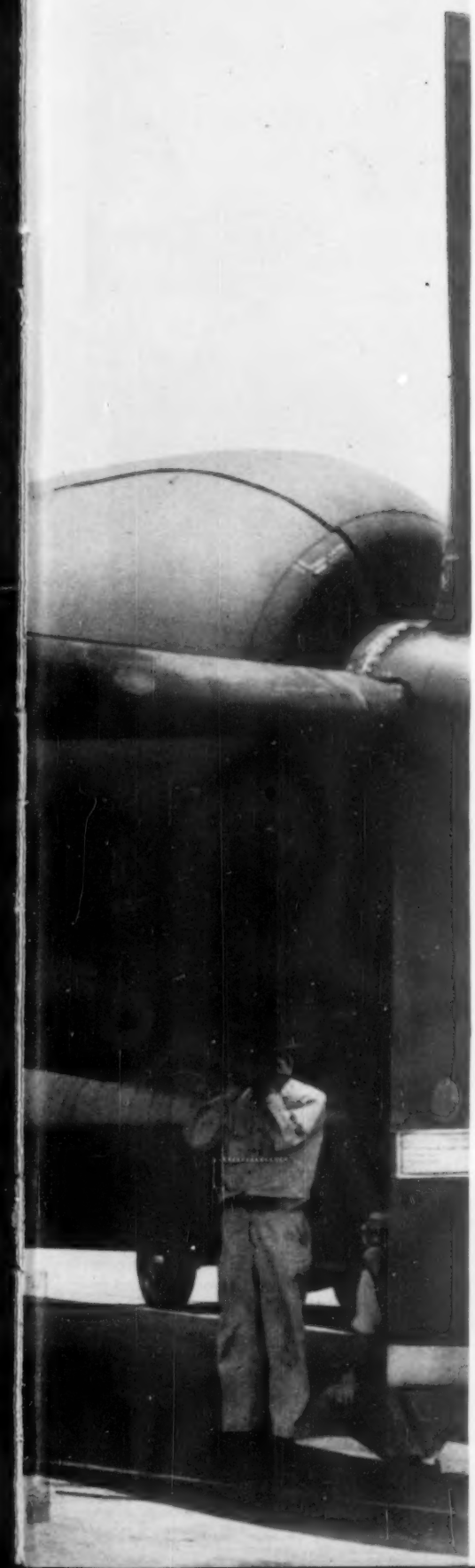
TOMORROW'S AIRCRAFT: *One step closer*

Field service engineering ...boosts jet engine life and reliability



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Westinghouse field service engineers help operating personnel conduct engine check-out prior to initial flight of Lockheed's P2V-7 Neptune. Podded auxiliary turbojets permit increased speeds and heavier loads.

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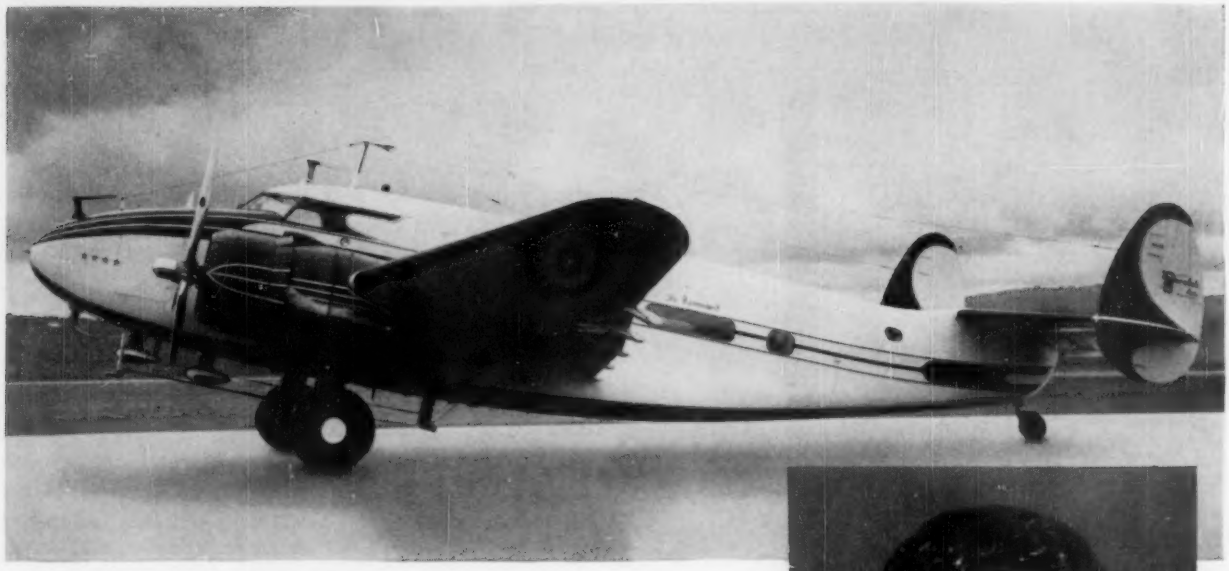

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Major Airport Aid:

Rothschild: No! Rizley and Lee: Yes!

By Katherine Johnsen

Civil Aeronautics Board Chairman Ross Rizley and Civil Aeronautics Administrator Fred B. Lee last week supported a sharply accelerated long range airport development program, leaving Under Secretary of Commerce for Transportation Louis Rothschild to defend the Administration's opposition to this plan.

Even Rothschild did not give full support to the Eisenhower Administration's handling of airport development. Pointing out that no money was made available for airport development in Fiscal 1954 to enable the Administration to make a study, that the sum for aid then was increased to $20.7 million in Fiscal 1955, and that the Administration then dropped its request to $11 million for Fiscal 1956, Rothschild observed: "That all happened before I came into office. I certainly would not endorse this up-and-down approach." (The House has increased the Administration's $11 million request and voted $20 million for Fiscal 1956.)

The three government representatives opened hearings on legislation establishing $63 million annual appropriation for federal airport development aid over the next four years—$60 million in the U.S. and $3 million in territories and possessions. Introduced by Sen. Mike Monroney (D-Okla.), chairman of the Aviation Subcommittee of Senate Commerce Committee, the measure is co-sponsored by five other Democrats (AW May 9, p. 111).

Rothschild Backs 'Stability'

Rothschild advocated "stability" in the airport program. But he opposed legislation setting a fixed appropriation for airports over a few years—such as the Monroney bill. He said that airport funds should be a matter of annual appropriation to permit "sound fiscal management" and enable the Bureau of the Budget to weigh airport requirements against other requirements for federal appropriation.

Noting that the Administration has recommended a program of $25 billion in aid for interstate highways over a period of years, Monroney asked: "How can this Administration be so liberal on highways, and then recommend almost a complete withdrawing from participation in airport development, which is primarily interstate in nature?"

Rothschild doubted that the Administration would support airport aid of $63 million annually.

Asked what he meant by "bringing stability" into the airport program, Rothschild responded: "My own desire and intention to work for a program with some stability in it." Monroney commented that he considered the Eisenhower airport program "about as rugged as you can get."

Rizley and Lee both refrained from specifically endorsing or opposing the Monroney bill, pointing out that the Under Secretary of Commerce for Transportation spoke for the Administration. But their testimony amounted to convincing proof of the need for a vastly expanded program.

Lee Outlines Needs

Rizley called for a "vigorous airport program." He pointed out that, over the past four years, CAB has had to authorize air carriers to suspend service at 88 points because of inadequate airports.

Rizley also urged that federal funds be available for financing terminal buildings—a policy opposed by the Administration. He said: "Passenger and freight handling facilities are becoming woefully inadequate. It now takes as long to get your baggage at Washington National Airport as it does to fly in from Chicago."

Under questioning by senators, Lee furnished these facts:

- **CAA's 1954 national airport** plan shows airport deficiencies at 2,078 locations, involving a total contribution requirement of $290 million.
- **Requests for federal aid for Fiscal** 1956, by states and local governments, totalled $105 million. Of these, CAA considered $75 million eligible under the criteria established by the Eisenhower Administration a year ago. (To qualify for federal aid an airport must have a minimum of 3,000 landings a year or 30 based aircraft, or a combination of the two, Monroney pointed out that at a rate of $20 million, it would take four years to take care of the justified demands for only Fiscal 1956.
- **CAA estimates an increase in passenger traffic** from $28.7 million in 1953 to $50 million by 1960, which would compare with $12 million in 1946. CAA's estimates, Lee said, have been exceeded: The 10% traffic increase CAA anticipated in 1954 over 1953 developed into a 22.5% increase.

Freight Inadequacies

Lee concurred with Monroney's observation that there are no existing civil airports capable of handling commercial jet aircraft, expected by 1960.

CAA anticipates a doubling of freight traffic by 1960, Lee said. He added that this would depend on cutting costs, which, in turn, would depend on improving handling facilities at airports. Lee concurred with Monroney's observation that "there are now no adequate freight handling facilities. They are all the kiddie car type."

Robert Aldrich, president of the Airport Operators Council, strongly endorsed the Monroney bill. He said: "There are no airports geared to take care of the Viscount that Capital Airlines plans to put into operation, because the Viscount can't wait a half an hour for landing."

India Seeks Possible Saboteurs

New Delhi—The Indian government has asked Hongkong authorities to speed up extradition proceedings on two Chinese being held on Formosa, for questioning with regard to the April crash of an Air India International Constellation enroute to Indonesia. The aircraft, under charter, was carrying Chinese Communist officials from Peking to Bandung for the Asian-African Conference.

Following sabotage findings by an Indonesian Enquiry Commission, the Hongkong government has admitted the possibility that a time bomb was placed in the wheel well of the "Kashmir Princess" as it was being refueled at Kaitak Airport. Preliminary Indian investigation reports refer to parts of a bomb having been found, and India is investigating the possibility of claiming compensation.

According to V. K. Krishna Menon, Indian diplomatic leader, the crash held up the release of the four USAF pilots, who were freed recently. On the eve of the conference at Bandung, India was asked to hold up its announcement of the flyers' release pending the findings of the Indonesian Commission.

New DME-Tacan Probe Urged

An exhaustive joint congressional investigation of the DME-Tacan navigation aid controversy was recommended last week by a House Government Operations Subcommittee on the Military.

Rep. Chet Holifield (D.-Calif), chairman of the subcommittee, was sharply critical of the military handling of Tacan.

He said it is "an example of the military going into full scale production on a procurement before the item is reliable."

Other committee recommendations:

- **Limit** the deliveries of Tacan equipment. "In no case should the Secretary of the Department of Defense permit further production deliveries in excess of such amounts necessary for technical development," the report stated.
- **Review** the functions of Air Navigation Development Board, Air Coordinating Committee, Civil Aeronautics Administration and military departments concerned with the common system for air navigation. The committee asked the President to report to Congress on the study and, if justified by the study, submit a reorganization plan.
- **Perform** a thorough audit of costs incurred on the outstanding contracts and the amount of the government's obligation under existing Tacan contracts. Audit would be done by the General Accounting Office. Subcommittee also asked GAO and Bureau of the Budget to submit an estimate by Dec. 31 of the projected ultimate cost of the military Tacan program.
- **Declassify** Tacan.
- **Provide** the committee with a report by the Secretary of Defense which would show cause why the current procurement order (for Tacan) should not be readvertised for the purpose of achieving greater competition and a possible reduction in costs.

PanAm Faces Stiff Mail Pay Cut

Pan American World Airways will take drastic cuts in mail pay for Latin American and trans-Pacific operations under terms of a Civil Aeronautics Board proposal.

The CAB has ordered Pan American to show cause why it should not set rates for Pacific and Latin American operations which cut the Pacific temporary mail pay nearly in half and reduce pay for the southern division by two thirds.

The order cuts PAA Pacific operations from the temporary annual rate of $11,402,000 set over a year ago to a strictly service mail rate. The new rate would produce an estimated $6,963,000 in 1955.

In Latin American operations, the order would set mail pay at $4,473,000 annually, compared to a forecast of $13,485,000 made by Pan American. Both temporary rates are effective Jan. 1, 1955.

The Board opened the mail rate for trans-Pacific operations in December 1953 effective Jan. 1, 1954. In April 1954, the $11.4 million temporary rate was set pending determination of a new final rate.

In setting the new temporary rate, CAB observes that the reported operating breakeven need for trans-Pacific operations for the year ending Mar. 31, 1955, was $4,608,000. The new rate is 50 cents a ton-mile, equal to the service rate established last December for both PAA and Northwest Airlines. Based on current estimates, the rate will yield approximately $7 million this year.

Pan American's Latin American rate was opened effective Dec. 31, 1954, when annual rate was $13,171,000. Primary reason for re-opening the rate was that PAA's Latin American Division subsidy requirement was high in relation to those of other U. S. carriers in the area and that improvement in the requirement should reasonably be anticipated, the Board stated.

Pan American forecast a mail pay requirement of $13,485,000 annually for Latin American operations. The Board notes that this reflects no improvement in the subsidy requirement, and the reported breakeven need for the most recent 12-month period, the year ending Mar. 31, 1955, was $4,473,000 the proposed rate.

In fixing temporary rates which involve subsidy, CAB policy is to provide only enough to sustain operations, but not less than the service mail rate.

Mail pay involved in the current rate and in PAA forecasts is high in relation to that received by other U. S. carriers, CAB observed.

Mail pay for Panagra, Braniff Airways and Delta-C&S Air Lines amounted to $4,856,000 in 1954.

New Canadian Flights

Canadian Pacific Airlines plans to start nonstop flights between Vancouver and Kitimat, aluminum company of Canada's smelting townsite on the West Coast. New service will be made possible by installation of new radio navigational aids by Department of Transport in British Columbia.

Board Stands Firm In Mail Pay Case

Requests of Pan American World Airways and Trans World Airlines that Civil Aeronautics Board reconsider a decision in the trans-Atlantic final mail rate case have been refused by the Board.

Both carriers asked CAB to change rulings made in a decision reopening the mail case to determine whether PAA and TWA have profits in other divisions which can be offset against the two airlines' trans-Atlantic subsidy requirements.

The carriers objected to rulings that operating results be reviewed under standards of honest, economical and efficient management in determining excess earnings of other divisions; that results of operations of other divisions governed by past period rates be excluded, and that results of PAA Latin American operations Jan. 1, 1946, to Apr. 5, 1948, be excluded. Pan American also asked to be allowed to introduce additional evidence.

CAB says it must review management practices, rather than just accept airline reports, because such a proceeding is necessary in determining need under terms of the Civil Aeronautics Act.

In relation to the other points, the Board found that the carriers' arguments didn't justify a change in the original decision.

Los Angeles Airways Reports $97,000 Net

Los Angeles Airways reports net profits increased to $97,007 during 1954, more than triple the $25,866 earned during 1953.

Operating revenues climbed to $840,865, reflecting the helicopter airline's first year of passenger and express services.

During 1953, mail and charter revenues totaled $690,342. Operating expenses for last year were $779,246, compared with $753,138 in operation costs during 1953.

The 1954 operating profit before retroactive mail pay totaled $61,618, a slight decline from $62,795 for the previous year.

The retroactive mail pay awards were: for 1954, $114,448; for 1953, $137,445.

President C. M. Belinn says LAA will add another Sikorsky S-55 next August to its fleet of four S-55s and three S-51s. The mail and cargo S-51s will be retired.

Belinn reports the airline will begin development this year of instrument flight.

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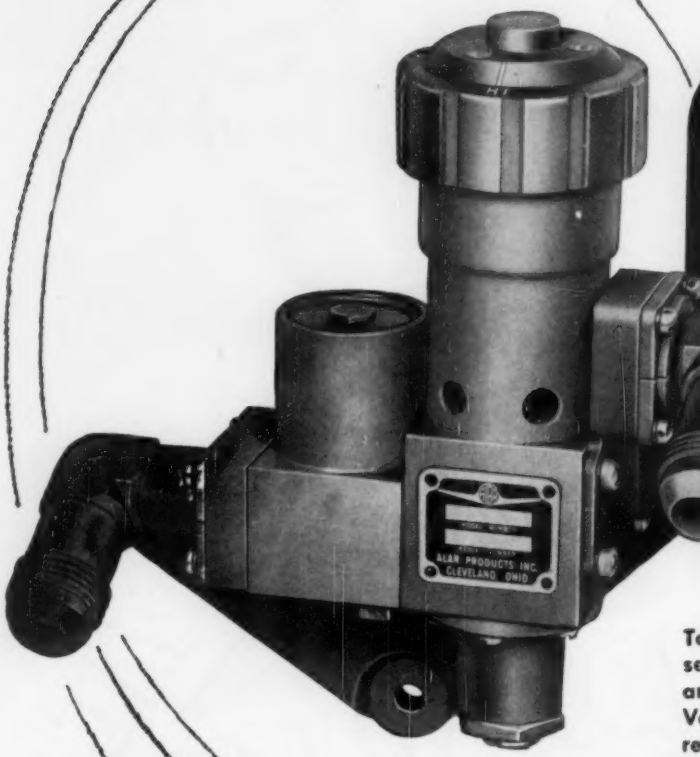

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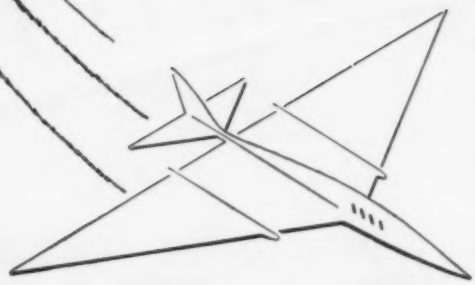

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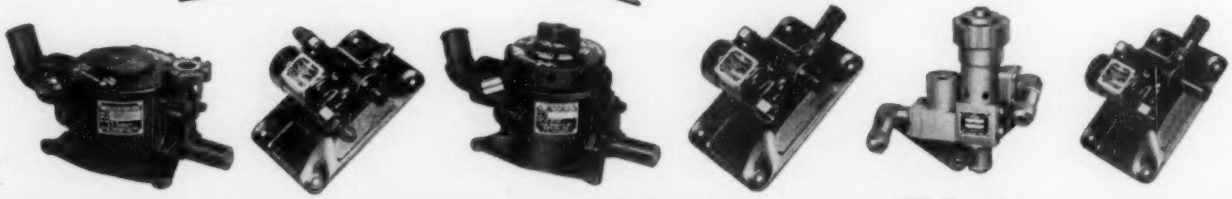

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KLM Leads Airlines' Opposition To PAA's Atlantic Freight Rates

By Gordon Conley

New York—Pan American World Airways and KLM Royal Dutch Airlines are waging a bitter fight over rate reductions proposed by PAA for trans-Atlantic air cargo. Last week KLM appeared to have the Civil Aeronautics Board and a majority of International Air Transport Assn. in its corner.

If the two airlines fail to settle their dispute before the present rate agreement expires June 30, it could result in:

• **Open cargo rates.** With no IATA agreement, a Pan American spokesman said, each trans-Atlantic air carrier would use whatever tariff structure it could push through the governments concerned.

• **Delayed reductions.** KLM predicted the present structure would be extended to Aug. 1 and a new tariff put into effect at that time. "It's the obvious thing to do," said an official of the Dutch airline. "We've asked for an extension and for another IATA meeting to draw up a new agreement."

Trans World Airlines backed up KLM's stand. "We'd like to see the present rates continued until present differences are ironed out," said one TWA official.

Opening Punch

First skirmish took place last month in Paris at an IATA traffic conference called to act on PanAm's plan to lower air cargo rates on North and Middle Atlantic routes. The proposal, adopted earlier by a meeting of airline vice presidents in New York, gave an average cut of 20% on about 50 commodities.

The Paris meeting broke up without agreement when KLM questioned Pan American's plan to give additional discounts at break-points of 3,000 lb. and 7,000 lb.

"We didn't understand the break-points," said a KLM spokesman. "They were pointless and couldn't possibly do any good. Maybe one shipment a month is flown at that weight. Breaking it down to groupings, the actual average is 158 lb. on freighters and 67 lb. on passenger transports."

"Since Pan American wanted the break-points, it should have been able to prove the need for it. We were ready to go along, but PanAm was unable to back it up to the satisfaction of 26 other carriers—including Trans World Airlines."

PAA officials said the opposition to break-points on bulk shipments showed poor planning for the future and little interest in building up air cargo. "If we don't set up volume rates," one said, "How are we going to attract volume shipments?"

No Decision

Pan American officials charged the Paris meeting was not called to vote on the rate cuts but to work out technical details of the proposals.

"The airline vice presidents adopted the reductions in March; IATA approved it unanimously by mail vote in April; all governments agreed," said one spokesman. "We understood the Paris conference was going to be a mere formality.

"We filed our tariffs with CAB and were astonished to find the other airlines had not filed theirs. KLM and the others backed down on their agreements."

The Dutch airline said Pan American was the primary barrier to lowering trans-Atlantic air cargo rates and accused it of trying to bull-doze its proposal through IATA "simply to attract publicity" to PAA.

"The New York meeting was an emergency conference where the proposal was agreed to in principle with the understanding that another meeting in Paris would be called to discuss the paper in detail, modify it and approve the new rates.

"We all wanted rate cuts. The only things we didn't want were the additional break-points. KLM was one of the leading carriers for reduction, and all the others agreed to reduce rates.

"But Pan American simply vetoed the efforts of all other airlines at Paris and took off on its own. PanAm proposed the rate cuts simply to attract publicity to itself."

Next Round?

Meanwhile Civil Aeronautics Board asked PAA to withdraw the new air cargo tariff structure filed in line with its trans-Atlantic proposal.

"This confuses us," said PAA. "The Board earlier told us the new rates were a fine compromise to the 45% cut we proposed for bulk shipments in February of 1953."

Pan American said the new tariff would stand as filed with CAB and, pending new developments, would go into effect July 1.

"The rate cuts have got to come sometime, and it might as well be now," said one PanAm spokesman. "Less progressive airlines don't give a damn about air cargo or its future, but they're going to have to let it grow someday."

Slick Builds Up Fleet

Slick Airways is adding three DC-4s and seven C-46s to its airfreight fleet in a new move to expand air cargo capacity and increased flight frequencies.

The scheduled airfreight line acquired the DC-4s through a lease-purchase agreement and bought the C-47s from the Air Force. They increase Slick's fleet to 22 airfreighters—two DC-6As, three DC-4s and 17 C-46s.

40% Rate Cut

American Airlines is reducing air cargo rates 40% on commodities ranging from wearing apparel to toys and lowering charges on cut flower shipments by 10% to 20%.

The 40% reduction went into effect last week, lowering air cargo rates from 20 cents to 12 cents a ton-mile on shipments from the West Coast to Midwest and East Coast cities. Principal commodities affected were clothing, dry and piece goods, textiles, footwear, gloves, handbags and purses, hosiery, leather goods, perfume, various sporting goods and toys.

The new cut flower rate will go into effect July 6.

ACC Announces New Aircraft Lease Plan

U.S. domestic freight operators that are unable now to afford new cargo aircraft last week were offered the opportunity to lease at commercial rates available military cargo planes from the Navy under terms of a plan approved by Air Coordinating Committee.

This is a government plan to assist industry efforts in promoting further development of commercial air cargo operations by providing additional capacity.

The rental rate will approximate $25,000 a month. It was originally a Navy proposal to create a reserve cargo fleet in-being (AW Feb. 28, p. 13). ACC's plan reduced in scope the Navy's ambitious program.

Preference Rules

The Navy currently estimates that it will be able to make available fewer than eight Douglas DC-6A aircraft that may be spared from its own operations through gradual rescheduling of Navy utilization. They have an active waiting list of 15 companies requesting approximately 45 planes.

Applicants will be screened by the

Civil Aeronautics Board which will make the final selection of carriers, although Navy will retain administrative responsibility. Preference will be given to carriers who have shown an historical interest in air cargo operations by:

- **Actual participation** in the air cargo movement.
- **Air cargo** promotion, advertising and solicitation.
- **Possession** of certification authorizing cargo transportation or a demonstration of earnest efforts to secure certification.
- **Substantial participation** in cargo charter or irregular air cargo operations.
- **Demonstrated requirement** for additional commercial cargo capacity.

Leased aircraft will be limited to commercial cargo use only, and will not be used in the performance of military contract or military charter operations. Use in passenger service is expressly prohibited. Leased aircraft can not be used to replace existing aircraft but must be a net addition to cargo lift.

High Rentals

The lease arrangements will be divided into two phases: First the aircraft is to be leased for an initial period not to exceed one year; after the initial phase, the lease is renewable only on the presentation of evidence that a firm order has been placed for a newly manufactured cargo aircraft. The renewal period specified in the contract would be tied to the delivery date of the new purchase.

Rental rates on the Navy aircraft will be high. ACC said this is necessary to prevent any element of subsidy either directly or indirectly. The leasing will be at rates in line with costs of commercial ownership. These are based on reasonable estimates of acquisition price, including all necessary equipment, the accepted 7-year rate of depreciation, rates of return and allowances for taxes.

ACC said these terms were designed to meet the following objectives:

- **Make** commercial air cargo capacity available more quickly than is possible through present placement of orders.
- **Encourage** experimentation with air cargo operations for a limited period prior to long-term financial commitments.
- **Stimulate** the procurement of additional cargo aircraft.

To avoid disruptions to the air transportation industry and eliminate conditions that might make lease preferrable to ownership, ACC also established rules which include:

- **Making** available only aircraft already owned by the Navy and banning the purchase of planes by the military for later lease under the program.
- **Setting** the terms of the lease high enough to avoid the element of subsidy and prevent upsetting air freight rates.

Senators Call CAA Service Cuts Pressure Tactic to Boost Funds

By Preble Staver

Washington, D. C.—A Senate Appropriations Subcommittee severely criticized the Civil Aeronautics Administration for attempting to "pressure" the group into restoring House-approved reductions in the Fiscal 1956 CAA budget. Brunt of the criticism fell on CAA Administrator Fred B. Lee who appeared before the subcommittee last week to justify the need for raising the House amount.

The subcommittee rejected Lee's testimony as "an effort to bring pressure in exactly the way that was instructed for you not to proceed by the House Appropriations Committee," the Senate group also advocated the immediate appointment of a deputy administrator.

The post of deputy administrator will be filled, according to Louis S. Rothschild, Under Secretary of Commerce for Transportation. The position was last held by Lee before he was appointed Administrator two years ago. Although the post was never abolished, Lee has never appointed a deputy. When he became Administrator, Lee created two additional assistant administrators who have divided the work of a deputy.

The absence of a deputy administrator apparently has been a source of difference between Lee and Rothschild. The Under Secretary now has overruled Lee. Rothschild told the senators: "CAA has had a deputy administrator and we're going back to it. We've just had a material demonstration of the need for the job."

'Less Than Satisfactory'

He said that Lee's "recent and unfortunate month-long absence from the office due to illness resulted in my contact with CAA for purposes of information as being less than satisfactory." Rothschild said he felt that "certainly any shop with over 15,000 people in it shouldn't be headed by one single person whose sole responsibility it is to make all the decisions and on whom all this responsibility rests."

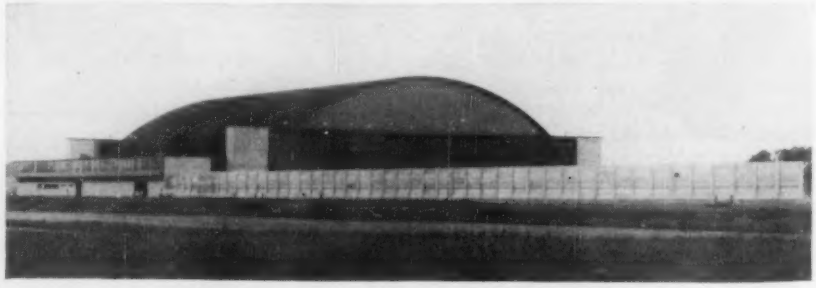
Rothschild is believed to have selected Charles Lowen as CAA's deputy administrator.

This new appointment probably will not be announced until the beginning of the new fiscal year July 1. Lowen, a former fixed-base operator and more recently Denver's director of safety and excise, joined CAA a month ago as a consultant.

Service Cuts

Lee's difficulty with the Senate Appropriations group developed when he told the subcommittee that unless the House reduction is restored in next year's budget (AW May 30, p. 95), it would be necessary to take the following actions:

- **Decommissioning** approximately 429 or 50% of the airway light beacons.
- **Closing** approximately 444 or 54% of the intermediate landing fields used for emergency landings of aircraft.
- **Closing** approximately 30 interstate aeronautical communication stations, or a total of 61 less than the number operated in Fiscal 1955.
- **Eliminating** new airport traffic control towers, distance measuring equipment, and direction finding equipments.
- **Eliminating** some planned in-bound and departure radar airport traffic control service and certain precision radar landing services.
- **Eliminating** a speed-up from 75 to 100-word per minute operation on the service "B" teletypewriter network for



American's Boston Hangar

American Airlines' new $2.5-million hangar at Boston's Logan International Airport features an experimental blast fence that is designed to deflect sounds away from a densely populated tenement area on the field's perimeter. The new hangar, taken over by AA on a 25-year self-liquidating lease, will accommodate four DC-7s or six Convairs. It is claimed to be the largest pre-stressed commercial airline hangar in the United States.

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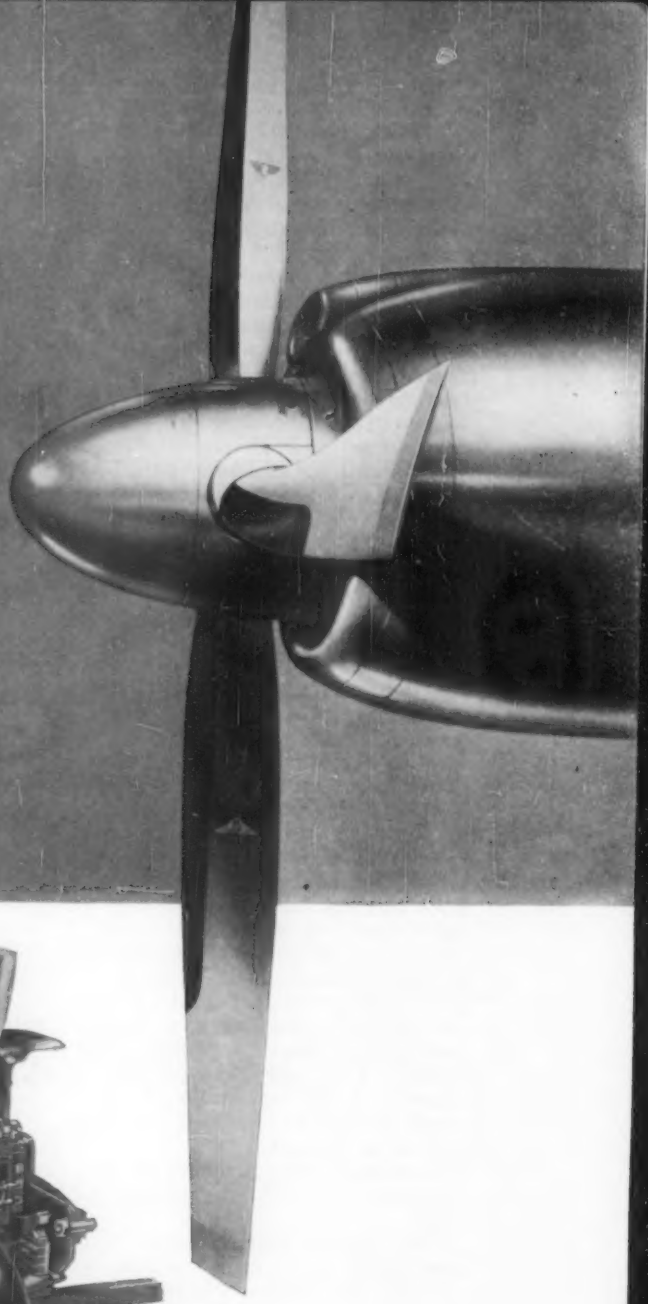

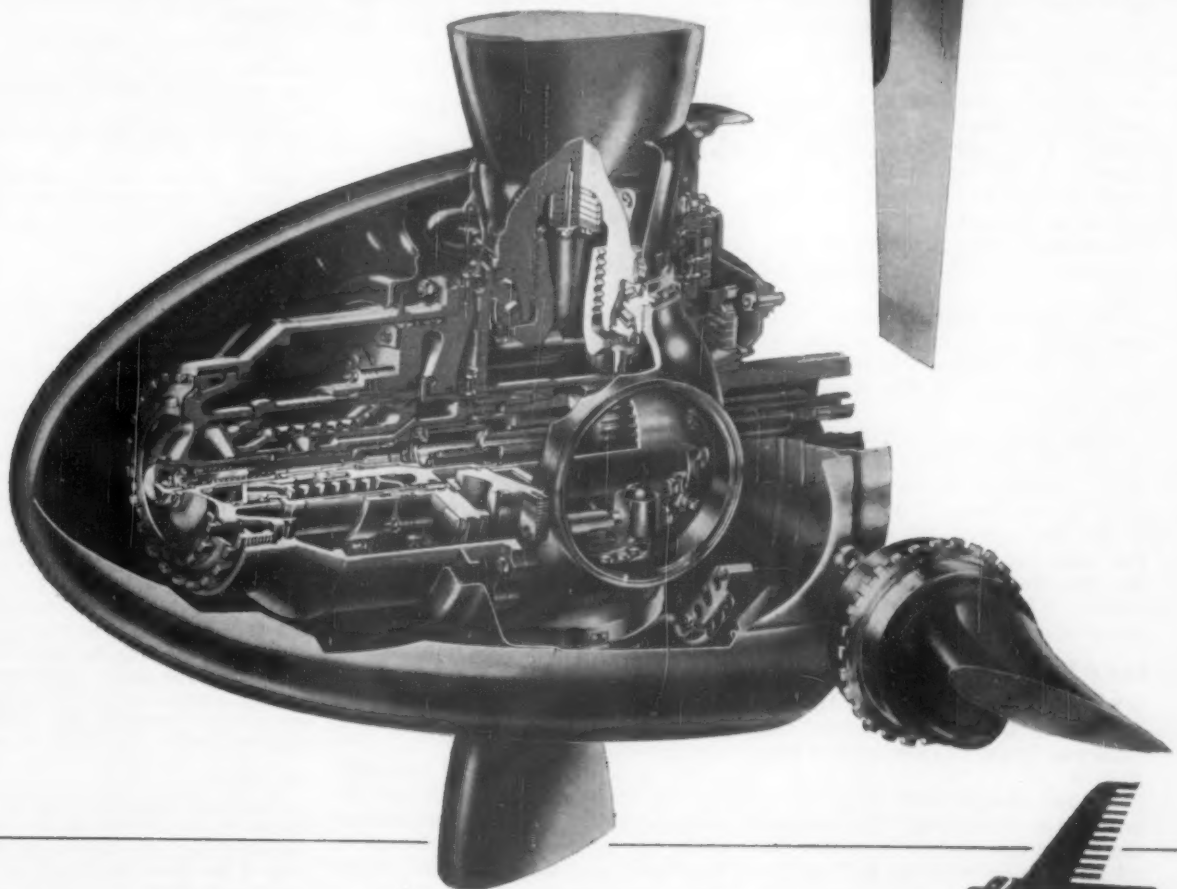

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Lee urged the Senate group to take the necessary steps to prevent "these actions which are adverse to our efforts of maintaining the established record of safety in aviation.

'Pressure Device'

Senate committee members immediately attacked CAA's attitude toward the House budget cuts. Chairman Spessard Holland (D.-Fla.) termed it "just a pressure device." He said: "It seems to me that if CAA proposes to apply these cuts in such a manner, they are violating completely the recommendations of the House committee because it directed the cuts should be applied in such a manner that safety in aviation will not be affected."

Sen. Holland further told Lee "there is no question the way you propose to apply these cuts would very seriously affect safety in aviation and that it is directly aimed at that objective. It is a complete failure by CAA to follow the suggestion and recommendation of the House committee." He added: "Every one of these cuts is directed at this very factor of safety which the House committee instructed you not to diminish."

Rothschild, who accompanied Lee, attempted to justify the position of CAA.

Sen. Holland told Rothschild: "It was hardly a reasonable position to say that this relatively minor reduction (3%) reflects all that destruction of air safety."

It was made clear by Holland that the Senate committee was not necessarily committed to the same course taken by the House. "We don't want to see the agency taking a position that looks like it is playing 'horse' with the recommendations of the House. Frankly, I believe that is exactly what you're doing," Holland said.

Lee's Reasoning

Sen. Styles Bridges (R.-N. H.) predicted that the CAA's proposed program was "going to cause quite a commotion."

Holland charged that the CAA approach was "unrealistic." He compared the House approved $159 million Fiscal 1956 budget with the $129 million provided for Fiscal 1955. Specifically, Holland emphasized an item for establishment of air navigation facilities in which the House allowed an increase from $5 million for Fiscal 1955 to $165 million for Fiscal 1956.

Lee replied that the items picked out for elimination, if necessary, would have the least effect on safety. He said, however, that "the dynamic growth of aviation and the resulting workload on CAA requires increasing the dollar level of all programs." Primary factors cited by Lee as affecting the workload were:

- **Increase** of military air services.
- **Expansion** of commercial operations.
- **Increase** of personal flying.
- **Expansion** of agricultural aviation.

Particular emphasis was placed by Lee on expansion of military operations which, he said, are causing real problems in assuring safe separation of aircraft.

Lee complained of CAA's inability to forecast the volume of workload generated by the military. He said it is "substantially in excess of what we had expected and will now more than saturate our capacity . . . we now find that human effort cannot be expected to produce much more traffic handling capacity from our existing systems. Some relief is necessary and, until an improved system is in operation, there are no alternatives available other than increasing the staffing or curtailing the amount of air traffic."

Pilot Error Blamed For Lodestar Crash

Failure to follow accepted single-engine procedure was the probable cause of the crash of a Lockheed Lodestar near Hartford, Conn., which caused the death of the co-pilot, according to the Civil Aeronautics Board accident report.

The report found that the pilot of the Lockheed, owned by John Fox, publisher of the Boston Post, failed to use the full power available and adopt accepted single-engine procedure when it became necessary to feather one propeller.

The crash occured on a flight between New York and Boston. Near Hartford, the right engine became rough and it was necessary to feather it. The pilot made a wide right turn and headed for Bradley Field, Windsor Locks, Conn. During the turn, the airplane descended from 3,500 to 2,500 feet, and it continued to descend after heading for Bradley field until it struck the ground.

The accident report found that while the operative left engine was not developing normal power for each setting, there was probably sufficient power to maintain flight under accepted single-engine procedures.

NAL Buys Radars

National Airlines will install airborne radar on its fleet under a contract with Bendix Radio Corp. of Baltimore, Md. Installation will be made on DC-7, DC-6B, DC-6 and Convair 340 equipment.

CAB ORDERS

(May 26-June 1)

GRANTED:

Port of New York Authority and the Metropolitan St. Louis Chamber of Commerce leave to intervene in the Eastern Air Lines route consolidation case.

Air France permission to serve San Juan, Puerto Rico International Airport.

APPROVED:

Agreements between Capital Airlines, Braniff Airways and various other carriers relating to intercompany arrangements.

Los Angeles Airways' flight pattern revision adding Burbank Heliport, Lockheed Air Terminal and Wilmington as points on various segments.

Resolutions between various carriers adopted by the International Air Transport Assn. relating to the effective date of North Atlantic and Mid Atlantic off-season family fares.

AMENDED:

A CAB order, to delete two paragraphs from the proposal of adjustment and consent of Colonial Airlines concerning creation of an executive committee and its relationship with the administration of Colonial.

Austin Airways Ltd.'s authorization to conduct an electro-magnetometer survey, to extend the termination date to June 30, 1955.

ORDERED:

Western Air Lines' exceptions to the Board decision in the reopened Western-Inland mail rate case overruled. A request for oral argument is denied and the decision is made effective immediately.

Allegheny Airlines be authorized to operate nonstop between Pittsburgh and Atlantic City between June 1 and Sept. 30, 1955, providing Allegheny continues to offer service presently provided to intermediate points between the two cities.

Investigation of certain east bound freight rates filed by American Airlines, Capital Airlines, Northwest Airlines, Slick Airways, the Flying Tiger Line, Trans World Airlines and United Air Lines be terminated, since the parties opposing the rates have withdrawn their complaints. Exceptions of the Railway Express Agency to rulings of the examiner be overruled and a petition of REA for leave to intervene be dismissed.

DENIED:

Eastern Air Lines' petition for reconsideration of the decision in the New York-Balboa service case and request for extension of the time limit for filing of interchange agreements.

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EDITORIAL

Jet Transport Race Enters the Stretch

American Airlines $65 million order for 35 Lockheed Electra turboprop airliners has stimulated unveiling of all the U. S. entries in the international jet transport race.

The turboprop sweepstakes that began as a four-horse race between Douglas, Convair, Vickers-Armstrongs and Lockheed, was won by the latter. With the Electra as a passenger liner and the C-130A as a commercial cargo plane, Lockheed now plays a strong hand in this market provided the Allison T56 powerplant development keeps pace.

Douglas and Boeing are now competing for the long range turbojet transport market with the DC-8 and the commercial version of the KC-135 military tanker, respectively. The Douglas decision to devote its immediate energy to getting the DC-8 prototype into the air was triggered, as Donald Douglas, Sr., indicated some weeks ago, by American Airlines choice for its turboprop transport award. The Douglas-Boeing turbojet race promises intense competition and some returns may be recorded even before the year's end. Both United Air Lines and Pan American are reported close to a decision on their turbojet equipment. However, American Air Lines prides itself on keeping a good jump ahead of its competition on equipment and may make a surprise move in this direction.

During our recent travels we have heard many expressions of admiration from airline engineers on the economics of the latest DC-8 proposal made possible by a comprehensive program of design refinement from the commercial viewpoint.

Reliable Engine

Boeing faces a tough problem in getting Air Force approval for its commercial production of the KC-135 design before the entire military tanker order is delivered to Strategic Air Command. Recent evidence of Russian progress in the production of long range Bison jet bombers and turboprop tankers may make it more difficult for Boeing to win its current argument with the Pentagon and SAC on commercial production.

Neither Boeing nor Douglas should have any concern over the JT3L turbojets they plan to use in their jet transports. In its J57 military version this engine has been in production at Pratt & Whitney Aircraft in East Hartford and, under license, by the Ford Engine Division in Chicago for more than two years. There are already more than 1,000 J57s in military service, and it has demonstrated reliable operation at the cruising altitudes proposed for the jet transports. Ironically although the J57 has been commercially certified by the Civil Aeronautics Administration at a rating of about 11,000 lb. thrust the Pentagon is still imposing military security restrictions that prevent Boeing and Douglas from discussing this engine with their prospective customers.

The Lockheed Electra turboprop in the medium haul class and the Douglas and Boeing turbojets for long range operations probably will meet airline requirements for as far into the future as it is feasible to predict at the moment. Both types represent the arrival of a fundamental powerplant revolution in the commercial field. The turboprop and turbojet will remain on the scene as the development cycle stretches their power for a good many years until another fundamental technical revolution—possibly nuclear power—displaces them.

Strong U.S. Hand

It is interesting to note that the widespread use of gas turbine powered transports now seems destined to occur in the 1959–60 period predicted by American aeronautical experts such as Donald Douglas and Frederick B. Rentschler of United Aircraft Corp. rather than in the early or mid-1950s as the British experts forecast.

In the international competition, primarily with the British, the U. S. gas turbine powered transport hand looks strong. Appearance of the Lockheed Electra with the endorsement of American Airlines will make prospects dim for any more large airline sales of the Vickers Viscount in this country. The Electra should provide extremely stiff competition abroad for both the later versions of the Viscounts and its successor now under development by Vickers with Rolls-Royce turboprops.

The Douglas and Boeing jet transports face the Bristol Britannia turboprop entry, the Vickers V-1000 using the Rolls-Royce Conway bypass turbojet and the de Havilland Comet IV with conventional turbojets. They should continue to uphold the dominance of American built equipment on the airlines of the world.

The international jet transport race is entering the final stretch. Decisive results should be forthcoming in the near future.

—Robert Hotz

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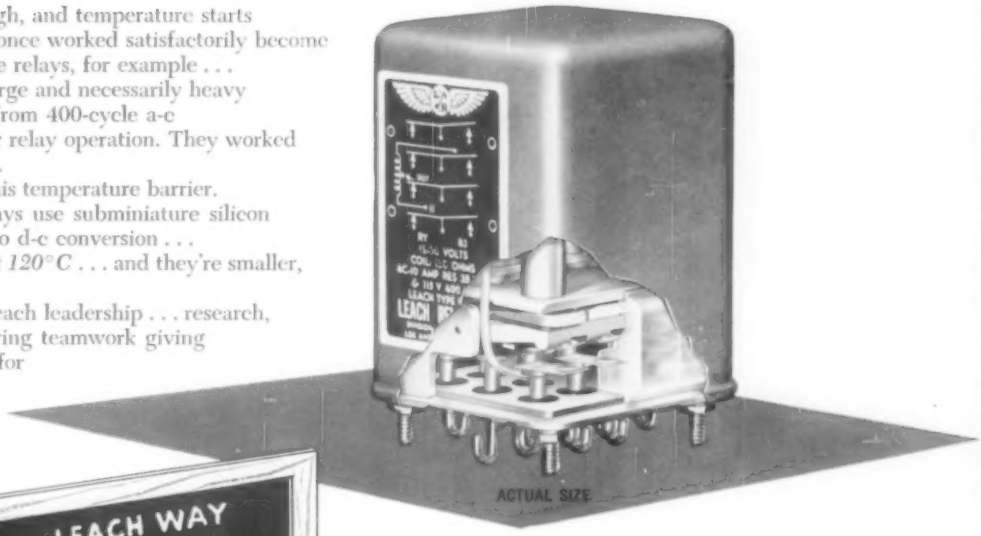
400 Cycle Aircraft Relays for 120°C Operation

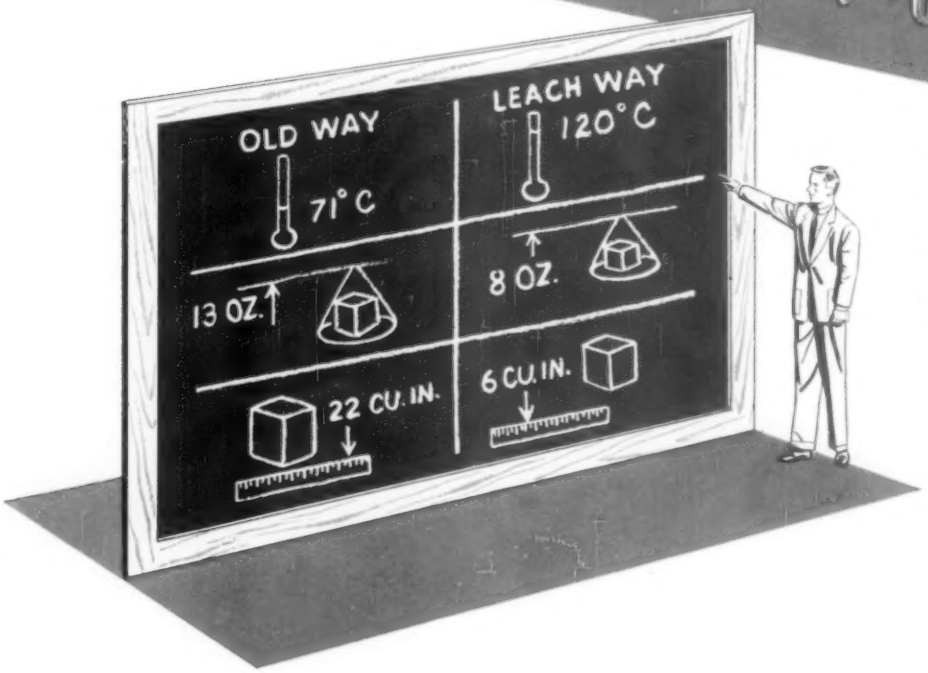
Get a plane going fast enough, and temperature starts climbing. Components that once worked satisfactorily become completely inadequate. Take relays, for example . . .

Yesterday's relays were large and necessarily heavy to convert a plane's power from 400-cycle a-c to the d-c more desirable for relay operation. They worked fine . . . *but only up to 71°C.*

Now, Leach has passed this temperature barrier. Its latest sealed aircraft relays use subminiature silicon junction diodes for the a-c to d-c conversion . . . *assure flight dependability at 120°C* . . . and they're smaller, lighter in the bargain!

It's another example of Leach leadership . . . research, engineering and manufacturing teamwork giving you equipment *today* ready for tomorrow's requirements.





Here's one of the new LEACH high-temperature 400-cycle aircraft relays . . . 9230 Series, a 4PDT, 10-amp model weighing 8 oz. Other models, with up to 6-pole and 5-amp capacity and weighing as little as 4 oz. are also available. All are designed in accordance with MIL-R-6106A and MIL-R-5757B.

LEACH CORPORATION / **LEACH RELAY DIVISION**

5915 AVALON BOULEVARD, LOS ANGELES 3, CALIFORNIA

LEACH RELAY DIVISION
PALMER GENERATOR DIVISION
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SERVING INDUSTRY IN THE LABORATORY . . . IN THE PLANT . . . ON THE GROUND . . . IN THE AIR

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LEACH CORPORATION INTERNATIONAL SALES AND ENGINEERING DIVISION, 332 WEST 21st STREET, NEW YORK, N. Y.

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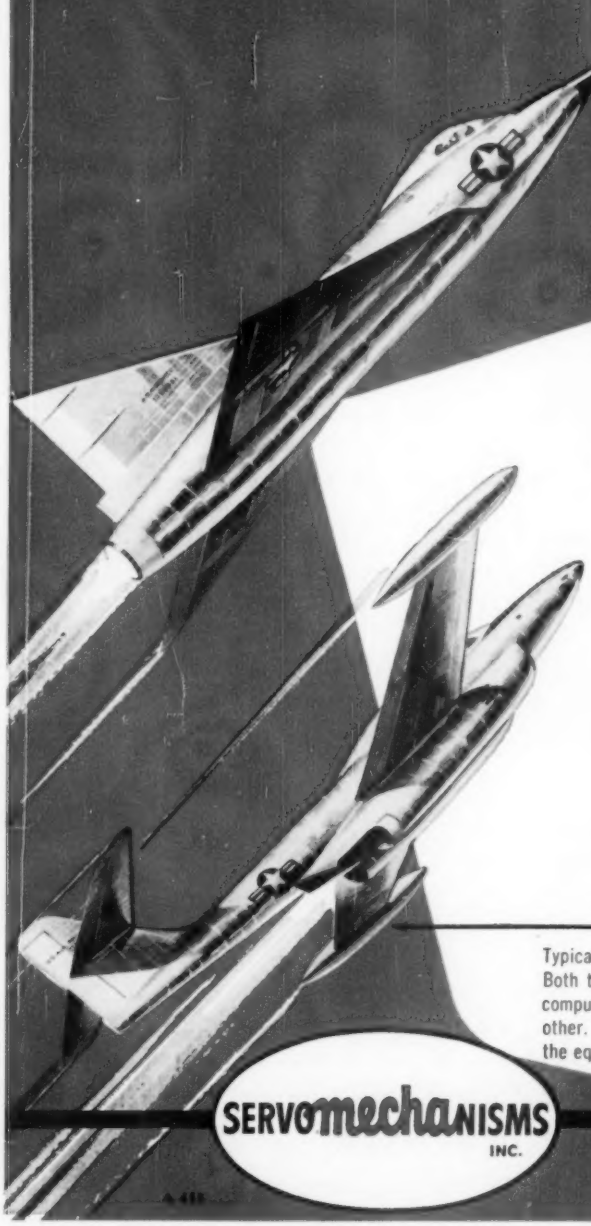
The MASTER AIR DATA COMPUTER

Another
SERVOMECHANISMS
Building Block
System

The Master Air Data Computer provides a single coordinated source for input information required by the various aircraft control and instrumentation systems. It is a central "clearing house" for aerodynamic intelligence. There is no fundamental limit to the number of functions, outputs or services that this computer can perform.



The Master Air Data Computer represents another outstanding example of Servomechanisms' design philosophy. As a result of our complete and careful analysis of the problem, our engineers have developed a series of standard plug-in components which, when assembled in "building block" fashion, produce many versions of the Master Air Data Computer—each for a specific application. Consequently each requirement can be tailored quickly and economically through the use of selected "building blocks." At most, only one or two of the "building blocks" require any internal changes. The remaining components are standard for all configurations. In addition to the fast economical and accurate solutions to our customers' problems, all plug-in components of the same type are completely interchangeable thus insuring **maximum** reliability through simplifying maintenance in the field.

Servomechanisms proven ability to **anticipate** and **interpret** our customers' needs, to **design** to specifications, to **produce** in quantity and **follow-up** throughout the life of the delivered equipment, all add up to a **complete service.**

Write for Air Data Computer Brochure, GA3.

Typical example of Servomechanisms "building block" philosophy. Both the Convair F102 and the Northrop F89 use variations of this computer. One requires somewhat different information than the other. A simple change in one of the plug-in "building blocks" and the equipment became custom made for each aircraft.

SERVOMECHANISMS INC.

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